MERSEY CROSSING STUDY - INTEGRATED TRANSPORT SOLUTION

FINAL REPORT - VOLUME 2 - MAIN TEXT

July 2000
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# MERSEY CROSSING STUDY - FINAL REPORT

The report is presented in three volumes -

**Volume 1 - Executive Summary**

**Volume 2 - Main Text**

**Volume 3 - Tables, Figures, Appendices**

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SECTION A - INTRODUCTION AND CURRENT SITUATION

1. INTRODUCTION

1.1 Studies investigating the transport capacity across the River Mersey have been ongoing for a number of years. Originally, the studies considered strategic level crossings and favoured a new crossing in or west of the Halton area. It became clear, however, that support for such a scheme (or other strategic level schemes) would not be forthcoming at national level. Recent work has focussed on the Halton area as the most appropriate location for the provision of additional crossing capacity at a sub-regional level.

1.2 The Mersey Crossing Group (a consortium of North West Local Authorities, chaired by Halton Borough Council) has, based on Ministerial advice, decided to pursue a new, sustainable, crossing via the Local Transport Plan process. The Council has a preference for a new low-level crossing in Halton, to the east of the existing Silver Jubilee Bridge, which would provide for local traffic, public transport, cyclists and pedestrians, with the Silver Jubilee Bridge adopting a strategic role.

1.3 WS Atkins has been appointed to study the situation in more detail, so that more specific proposals can be included in the Halton LTP which is to be submitted in July 2000. This study is to determine the effectiveness of the new bridge in attracting local traffic (and, indeed, whether attempting to separate ‘local’ from ‘sub regional’ traffic is an appropriate course of action), and considers connections to the highway network for all modes of transport. The study also takes account of the impact on economic regeneration and the environment, engineering issues and finance. The study is to present a robust case which can be included in the five year Local Transport Plans.

1.4 The main thrust of the study is to determine, in transport planning terms, the optimum way forward. The principal part of the study, therefore, considers the demand for movement across the river and how it can be provided for in a manner which encourages the use of public transport, so that the bridge(s) across the river provide a convenient link for both car owners and non-car owners, and those using non-motorised modes.
The main tool for the analysis of the situation is a SATURN traffic assignment model, built specifically for examining the river crossing issue. The model would, however, also form a good basis from which a model for the whole Borough could be developed. Previous studies have been based on origin and destination information collected in the early 1990s (and earlier). Prior to the commencement of our study, Halton Borough Council had commissioned Oscar Faber to organise the collection of roadside origin and destination information for northbound traffic crossing the Silver Jubilee bridge and for similar information to be collected from passengers using cross-river bus services. The data from these surveys, together with recent traffic count information, and bus timetables, represent the data sources for this study. In addition, Halton Borough Council has made available reports from earlier studies, together with digital OS mapping of the area, and some drawings relating to existing highway infrastructure.
2. THE CURRENT TRANSPORT SITUATION

Introduction and History

2.1 Runcorn Gap is the most downstream 'narrow' point in the Mersey Estuary (see Figure 2.1). For centuries, a ferry existed at this narrow point, and Runcorn and Widnes developed adjacent to this important river crossing point. In the 19th century the railway bridge was built, taking advantage of the short crossing possible at Runcorn Gap, and a road vehicle transporter bridge was constructed at the start of the 20th century. In 1961 the transporter was replaced by the current road bridge. The bridge and approaches were built as a wide single carriageway, which soon reached capacity. Within a few years the bridge was operating close to capacity, so improvements were undertaken – the northern approach road was grade separated and increased to dual three lanes, and the Runcorn expressway system was developed, providing dual two-lane approaches on the south side. The bridge itself was widened to four narrow lanes (two in each direction) by structural alterations to the steelwork and relocating the footway on the outside of the bridge. Most recently, an Eastern By-pass of Widnes has been constructed, connecting with the northern approach road immediately prior to the bridge.

2.2 The bridge (now known as the Silver Jubilee Bridge) is the most westerly free crossing of the Mersey (the only road crossings to the west are the tolled Mersey Tunnels). Traffic continues to grow and has now reached almost 80,000 vehicles per day – well in excess of the design capacity, and traffic queues for 1 to 1.5km on all approaches in the peak periods.

The Surveys

2.3 The roadside and bus origin and destination surveys were carried out on weekdays in November 1999. The roadside surveys interviewed only northbound traffic, using separate interview locations on the two approaches to the bridge on the Runcorn side of the river – A557 Weston Point Expressway (the western approach to the Silver Jubilee Bridge), and A533 Bridgewater Expressway (the eastern approach to the bridge). The survey locations allow various items of data to be presented for the two approaches separately, as well as for the bridge as a whole. Traffic count information allows the northbound information to be used to predict information for the southbound direction too. The key items discussed in the paragraphs below refer to both directions of flow added together, though (as the results are extrapolated from northbound information) tables are presented using the southern end of trips as the 'origin' and northern end as the 'destination' – and 'Widnes' is used to refer to all of Halton Borough on the north bank of the Mersey, and 'Runcorn' for Halton on the south bank.
2.4 Whilst interviews of bus passengers were carried out both northbound and southbound, control totals were only observed northbound, so the two-way information presented for bus passengers is also extrapolated from only northbound interviews.

2.5 A significant amount of additional congestion was reported during the execution of the roadside interview surveys, leading to a depression of peak hour flows on the survey days. Our presentation of the results makes use of automatic traffic counting data collected over a week in November, but the survey days have been removed from the information to avoid distortion.

Daily Vehicular Traffic

2.6 Table 2.1 summarises the total 24 hour 2-way flow using the Silver Jubilee Bridge on an average weekday in November 1999. Key facts are:

- Total traffic flow was just below 80,000 vehicles
- 16,000 vehicles (20% of the total) start and complete their journeys within Halton ('local' traffic)
- 30,000 vehicles (38% of the total) start and finish their journeys beyond the Halton Boundary ('through' traffic)
- the remaining 33,000 vehicles (41% of the total) have either the start or end of their journey (but not both) in Halton.

2.7 The nature of traffic using the A557 and A533 southern approaches to the bridge varies considerably:

- 61% of traffic on A557 is 'through' traffic, whereas only 18% of A533 traffic is 'through'
- whilst 31% of traffic on A533 is 'local', only 8% of A557 traffic has both trip ends in Halton

2.8 Journey purpose information was collected as part of the interviewing process, and this allows the proportions of different types of traffic to be ascertained. Table 2.2 splits the bridge crossing traffic into five categories:

- Car\(^1\) Trips which start or finish at a Halton resident's home
- Car Trips which start or finish at a Halton employee's\(^2\) workplace (excluding trips already allocated to the first category)
- Goods vehicles which either start or finish their journey at a Halton address
- Other 'through' goods vehicles

\(^1\) In this context 'car' includes motorcycles and vans, but not goods vehicles.

\(^2\) 'Halton employee' refers to anyone whose workplace is located within the Borough Boundary, and not solely to Council employees.
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- Other trips – mostly ‘through’ cars, cars calling in Halton other than for ‘home’ or ‘work’ purposes, and a small number of coaches.

2.9 Halton residents and employees have been separately identified to allow separate assessment of their movements within the Borough.

2.10 Table 2.2 indicates that –
- Goods vehicles account for 7,000 trips (9% of the daily traffic)
- Halton residents make up over 26,000 (one third) of the daily traffic
- Halton employees constitute almost 13,000 trips (16% of the daily total)
- Over 33,000 vehicles (42% of the total) fall into the ‘other’ category.

2.11 The table also shows the split between the A557 and A533 approaches. Over two-thirds of traffic on the A533 Bridgewater Expressway approach is associated with the Halton categories; whereas, over two-thirds of traffic on the A557 Weston Point Expressway is not.

2.12 Traffic using the bridge has been allocated to the local authority area in which the trip starts or finishes. Table 2.3 summarises this information. The first page of the table sets out the location of the southern ‘origin’ end of trips, and the second page of the table the northern ‘destination’ end. The table shows that –
- Halton (Runcorn) constitutes the southern end of virtually half of all bridge crossing trips
- With the exception of Vale Royal (12%), no other area provides more than 8% of the southern end of the trips.

2.13 The percentage elements of the table should be interpreted as follows. The middle section of the table subdivides all traffic (and traffic on A533 and A557 separately) into the proportion from each district – for example, 49% of all traffic has its southern trip end in Halton; 73% of traffic using A533 Bridgewater Expressway approach has its southern end in Halton, whereas only 22% of traffic on the A557 Weston point Expressway approach has its southern end in Halton. The lower part of the table indicates that of the traffic which does, for example, originate in Halton, 80% of that traffic uses A533, and 20% uses A557. Similarly (and not surprisingly), the vast majority of traffic with its southern trip end in Chester, North Wales, Ellesmere Port, or the Wirral uses A557, and the majority of traffic associated with Halton and Warrington uses A533, but there is a much more even split of traffic between the two approaches for Greater Manchester, Vale Royal, and South and East Cheshire traffic.

1 South and East Cheshire includes the Districts of Crewe & Nantwich, Congleton, and Macclesfield, each of which provides only a small proportion of the total flow on the bridge.

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2.14 As regards the northern end of Bridge-crossing trips, Halton (Widnes) provides just one-third of the destinations, with just over 30% bound for various parts of Liverpool. With the exception of Knowsley (12%), no other District provides more than 8% of the trip ends.

2.15 Table 2.4 tabulates the number of trips travelling between each of the Districts north and south of the Bridge. The table indicates the total flows for the bridge as a whole, and also separate tabulations for the A557 and A533 southern approaches. District to District two-way movements in excess of 2000 trips per day include—

- Halton (Runcorn) to Halton (Widnes) – 16000
- Halton (Runcorn) to Liverpool – 10000
- Halton (Runcorn) to Knowsley – 4000
- Halton (Runcorn) to Warrington (north of the River) – 4000
- Halton (Runcorn) to St Helens – 3000
- Vale Royal to Liverpool – 4000
- Vale Royal to Halton (Widnes) – 3000
- Chester to Liverpool – 2000
- North Wales to Liverpool – 2000

**Hourly Vehicular Flows**

2.16 Significant queuing takes place on the approaches to the Silver Jubilee Bridge in both directions during both morning and evening peak periods. In the absence of incidents, off-peak traffic is generally free-flowing.

2.17 In the northbound direction, the two approaches taper to a single lane just prior to reaching the bridge, and each of these single lanes feeds directly onto one of the traffic lanes on the bridge. The traffic from the two approaches thus does not actually merge prior to crossing the bridge—the capacity of the two approaches is thus largely independent of the flow on the other approach though, clearly, the streams of traffic do need to weave whilst crossing the bridge. Analysis of the morning peak data indicates that the northbound flow over the bridge is limited to about 3650 vehicles per hour, with the limit from A557 being about 1800 vehicles per hour, and the limit on the A533 approach (which has a slightly greater horizontal radius and gentler gradient) being about 1850 vehicles. Both these values are in excess of normally accepted design standards for single lane slip roads.
2.18 In the southbound direction, a single lane slip road from the Ditton Road roundabout combines with the two-lanes which fly-over the roundabout from A562 Liverpool to form three lanes on A533. The minor slip road from the West Bank Dock area merges into this three lane carrigeway. Prior to the merge with the connection from A557 Widnes eastern By-pass, the three lane A533 approach is reduced to two lanes. The two lanes of the A557 are reduced to a single lane prior to the merge point, and traffic on this single lane then merges with traffic on the two lanes on the main approach road. The bus lane from West Bank also merges at this point.

2.19 The A557/A533 connection on the north side is a true merge. At busy times, traffic on A557 approach relies on traffic on the A533 approach to hold back, or move into the offside lane, to allow A557 traffic to join. The effective capacity of the A557 approach is thus dependent on the level of traffic flow on the A533 approach. The overall capacity in the southbound direction is thus influenced by driver behaviour and appears to vary more on a day to day basis than the northbound capacity, generally falling into the 3300 to 3600 vehicles per hour range, with the A533 approach providing up to 2700 vehicles per hour, and the A557 approach up to 1000.

2.20 Off peak flows in each direction on the Bridge amount to typically 2500 vehicles per hour.

**Bus and Bus passenger Flows**

2.21 The surveys were carried out by a surveyor boarding a cross-river bus on its departure from Runcorn High Street, and interviewing as many passengers as possible, prior to alighting at Victoria Square. (Enumerators then boarded a southbound bus and interviewed on the return journey; however, as there were no control totals collected for the southbound journeys, and for consistency with the roadside surveys, the analysis presented in the following paragraphs uses northbound interview data and counts only).

2.22 There are six daytime River-Crossing bus services:

- Service 14 – Murdishaw to Liverpool via Hough Green
- Service 32 – Murdishaw to Liverpool via Halebank
- Service 61 – Murdishaw to Liverpool via Farnworth (Black Horse)
- Service 62 – Warrington or Windmill Hill to Crow Wood
- Service 110 – Murdishaw to Warrington via Dans Road
- Service X5 – Windmill Hill or Murdishaw to Liverpool via Speke

2.23 The X5 is an express service and does not stop between Runcorn High Street and Speke; it thus cannot be used for Bridge Crossing trips within Halton. All the other services call at Halton Lea, Runcorn High Street, Victoria Square (Widnes Town Hall), and Green Oaks shopping centre in Widnes.
2.24 The surveys indicate that

• about 1400 passengers travel northbound across the bridge on a November weekday (between 0700 and 1900 hours)

• around 270 of these travel in the morning peak hour, but after 1000 hours, the hourly flow is around 100 passengers per hour, even during the evening peak period

• during the morning peak hour typically 17 buses cross the bridge in the northbound direction, with between 13 and 15 per hour during the rest of the working day.

• About 120 buses cross the bridge northbound between 0700 and 1900, each carrying on average 12 passengers.

• 375 passengers were carried on the survey day on service 110, with X5 and 32 carrying between 200 and 300 passengers; other services carried between 140 and 200.

2.25 Surveyors boarded 76 (48%) of the northbound buses and interviewed 255 passenger ‘groups’ \(^4\) – about 19% of all passengers. The 1440 total passengers during the day formed about 1330 passenger groups, and Table 2.5 allocates these groups to their District of trip origin and destination, in a similar way to the vehicle origins and destinations discussed in an earlier section. (Results have been doubled to represent both directions of flow, for consistency with the tabulations for road traffic).

2.26 The range of Districts covered by bus passengers is unsurprisingly more restricted than for private car trips. The southern end of virtually all trips lies within Halton (Runcorn). Only 1% commenced their journey outside Halton. Ten commenced their journey in Crewe & Nantwich, Vale Royal, or Chester. It is not clear how they made their way to Runcorn (the surveys did not cover this issue), but it is plausible that these passengers transferred from train to bus at either Runcorn or Runcorn East stations. Clearly the combination of train and bus for cross-river journeys is minimal.

\(^4\) Passengers travelling together (such as parents with children, or two or more people going shopping together) were interviewed as one group. This is analogous to interviewing only the driver at a roadside interview survey; the relationship between passenger group numbers and passengers numbers is equivalent to the concept of vehicle occupancy in relation to private car movements.
2.27 Halton (Widnes) predominates as the destination District (64% of all trips), but significant numbers are using buses to reach various parts of Liverpool (22% of all trips), and Warrington (north of the river) – 11%. 
SECTION B – POLICY AND ISSUES CONTEXT

Introduction

This section of the report considers a wide range of issues which influence the identification of potential new bridge crossings, and the form of the new crossing.

3. THE PLANNING CONTEXT

3.1 This section of the report considers the planning policy framework relating to the second Mersey crossing, identifies the various strategies and initiatives which apply in the local area and also considers the likely impact on land use and regeneration of the potential crossing routes.

Regional policies

Regional Strategy for the North West

3.2 The Regional Strategy for the North West to 2020 was published by the North West Development Agency in late 1999. It sets out a vision for the North West which is to create a region which:-

- attracts and retains the skilled and talented,
- brings everyone into the mainstream of community life,
- nurtures its environment, heritage and culture,
- kindles creativity, innovation and competitiveness,
- transforms its image,
- strengthens its infrastructure, and
- is naturally on the shortlist for new investment.

3.3 Investing in infrastructure is a key strand to the strategy and the three objectives of this element of the strategy are to secure clear physical plans, strengthen strategic communications and support regional, cultural and sports infrastructure. Much of the emphasis on priorities for early action lies with the development of infrastructure for strategic business sites, including Daresbury Park at Runcorn, as well as measures to integrate planning and transport in the Mersey Belt’s Southern Crescent, which includes the Runcorn and Widnes area.
3.4 The strategy notes that the Mersey Belt has important European and strategic dimensions and that there is a need to consider the contrast between the areas north of the Mersey and those to the south. Within the Southern Crescent the main issues are to secure regeneration, particularly to the north of the river and develop integrated transport solutions. The strategy identifies the fact that the Southern Crescent lacks an integrated public transport grid and is highly dependent on car commuting. It recommends that the reviews of Regional Planning Guidance and of the Regional Transport Strategy need to consider how opportunities in the area can be accessed by sustainable transport and how to create urban structures which are compatible with sustainable transport.

3.5 Objective IN2 is to strengthen strategic communications. This includes pressing for action to improve access to the Mersey Crossing at Runcorn. However, the strategy notes that improvements will not necessarily relate to the provision to wholly new roads but could involve packages of effective traffic management, better public transport, as well as improvements to roads and limited new road building.

3.6 In the context of the emerging Regional Strategy therefore, the case for a second crossing would be strengthened if it could be demonstrated that measures would be incorporated to benefit public transport and to extend the established public transport network south of the river into Widnes. In this way the movement of residents to work and to other facilities within the wider urban area could be made more sustainable.

Regional Planning Guidance

3.7 The Draft Regional Planning Guidance for the North West, ‘People, Places & Prosperity’, submitted to the Secretary of State in July 2000 by the North West Regional Assembly refers specifically to the Mersey Crossing at Halton. The corridor from M56 at Junction 12 via Runcorn Gap and A562 to Liverpool Airport is listed in paragraph 12.6 of the draft RPG as a Strategic Access Route, and this study is listed in Table 10.1 as a Regionally Significant Transport Study. Furthermore, a new crossing of the Mersey at Halton is specifically highlighted in paragraph 10.37 of the draft RPG as a regionally significant proposal identified for delivery by 2021.

3.8 The draft RPG follows on from the Regional Planning Guidance Review document “Choices for the North West” which recommended a vision of balanced growth. This would favour the re-use of previously developed land and buildings in sustainable locations rather than greenfield sites. Multi-modal solutions are to be sought to transport problems. The route across the Mersey is identified as a key transport corridor. Such transport corridors are to be the focus for investment with an emphasis on the development of public transport systems.
Local Policies

Halton Local Plan

3.9 The Halton Local Plan was adopted by Halton Borough Council in April 1996. The main aim of the Plan is to transform the quality of Halton’s environment and improve its economic prosperity.

3.10 Major Objective 7 – Increasing Accessibility – sets out a number of sub-objectives, including promoting new road schemes, in particular, a second road crossing of the Mersey, and improving public transport.

3.11 The Plan notes that any crossing should maximise development opportunities on the river front and be designed to be capable of use by public and private transport, pedestrians and cyclists. It suggests that a second river crossing should be located east of the existing bridge and form a connection between the Widnes Eastern By-Pass and the Runcorn Expressway. As it was recognised that the proposal was unlikely to be achievable within the Plan period (up to 2001) there were no firm proposals shown on the Proposals Map.

3.12 The Plan contains a number of proposals and policies which apply to the areas likely to be effected by any proposed road link. These are reviewed below.

3.13 North of the river, an area of Special Development Opportunity is identified at Spike Island/Widnes Warth. This identifies an opportunity for new water-sports, boating and associated leisure facilities, provided they do not detract from the nature conservation interests of the Estuary. The extent of this designation reflects the findings of the Halton Water study (see later). Widnes Warth itself is identified as part of the green space system with the western tip included within the Spike Island site of local landscape value. Both these designations are intended to offer a degree of protection from development pressures.

3.14 North of the St Helens Canal, an area between the canal and Fiddlers Ferry Road is identified as a Primarily Employment Area. In such areas, land is to be retained for business and industrial use.

3.15 A long strip of land between St Helens Canal and Moss Bank Road is identified as another Area of Special Development Opportunity. This area is known to be contaminated to varying degrees as it was formerly occupied by a large chemical works. Significant areas are vacant and derelict. Policy GS3, which covers this area, notes that the future development pattern and uses of the area fronting the St Helens Canal should be related to and take advantage of the waterside location beside the canal and Mersey Estuary and must make a significant improvement to the waterside environment. The eastern end of this site, between the remaining chemical works and the power station, is occupied by a disused tip which is identified in the Plan as a proposed open space. To the north of this lies the Shell Green area where land is allocated for future employment use. Much of this land remains undeveloped though a portion has been taken for the Shell Green Incinerator operated by United Utilities.
3.16 There are also a number of smaller development sites identified in the Local Plan. A site at the corner of Moss Bank Road and Gorsey Lane is now used by a freight distribution company, while a smaller site close to the junction of Tan House Lane and Moss Bank Road remains vacant. Significant areas of land are also allocated for employment development to the east of the Widnes Eastern By-Pass at Lugsdale. Most of this land has yet to be developed.

3.17 On the south bank of the river the Astmoor Industrial Estate is identified as a Primarily Employment Area and within it three small to medium size sites have been allocated for employment purposes.

3.18 A Grade B Site of Biological Importance is identified running along the south bank of the Ship Canal adjacent to the Astmoor Industrial Estate. North of the canal lies Wigg Island and the Astmoor Salt Marshes. The Astmoor Salt Marshes are designated as a Grade C Site of Biological Importance. Sites of Biological Importance are covered by Policy ME8 in the Local Plan, which states that development will not be allowed if it is likely to cause significant harm to the features of biological importance for which the affected site is designated. Grade B means that the site is of district importance, while Grade C means that it is of local importance for the habitats, plants and animal communities or species that they support. Such sites do not have statutory protection. Both Widnes Warth on the north bank of the Mersey and the Astmoor Salt Marsh /Wigg Island site on the south bank are identified as green space in the Local Plan and are to be protected from development. Any adverse impacts of development on the green space system will be measured in terms of its visual impact, impact on the landscape, nature conservation and on the recreational value of the green space. A substantial tranche of land to the east of the Astmoor East Interchange on the A558 is identified as urban green space which is similarly protected.

3.19 One could conclude that, while the principle of a second crossing would be in accordance with the objectives of the adopted Local Plan, alignments for a crossing to the east of the existing bridges would be in conflict with landscape and nature conservation policies to varying degrees. Should, as might be expected, the new road stimulate economic activity, this might assist in maintaining and improving industries and businesses in the Primarily Employment Areas on either side of the river, thus supporting this policy.
Halton Unitary Development Plan

3.20 Halton Unitary Development Plan will, when adopted, replace the provisions of the Halton Local Plan. A draft version of the UDP is currently in preparation and should be published in July 2000. In January 1999, a Key Issues Report was published to test public reaction to a range of issues which the UDP will need to address. In respect of the second Mersey Crossing, the Issues Report asked what should be its role and how it could be designed to benefit urban regeneration and the transport needs of residents without encouraging the generation of new car traffic. It raised the possibility that a new crossing should be designed with local traffic in mind, this would allow the existing bridge to cater for the fast strategic route.

3.21 The Key Issues Report noted that a new crossing of the Mersey could provide an impetus to the regeneration of derelict industrial land and improve public transport links across the river by freeing up congestion on the existing bridge. It could also have wider regional benefits. In addition to the promotion of economic development, the UDP Key Issues Report also suggested opening up the foreshore of the Mersey Estuary for recreation and leisure activities.

3.22 Options for meeting the demand for development land are currently being considered by members. Among the options which are being considered are the release of further land for both housing and employment in the Daresbury area; the reclamation for housing development of Widnes Warth on the north bank of the estuary; and additional housing and employment land on the northern edge of Widnes. The issue of the second crossing will need to be factored into this decision making process. It would clearly be a vital element in achieving the second of these options.

Halton Regeneration Strategy

3.23 A regeneration strategy for Halton was published in March 1998 by the Halton Partnership. This document identified four Themes for Regeneration

- Environment and Infrastructure
- Quality of Life
- Economic Development and Training
- Community Regeneration
3.24 Environment and Infrastructure incorporated the transport theme and identified the opportunities associated with a second crossing of the River Mersey. It noted that efficient transport provision and management is an essential regeneration tool and that the objectives of this strategy would not be achieved if industry and population do not have access to the right transport links. For this reason, the focus of regeneration priorities 1998/99 included the investigation of solutions for a second river crossing as well as measures to explore methods of improving public transport and the continued success of the Runcorn busway. It was proposed to establish an action plan to improve transport within the Borough through the improvement and integration of transport facilities and also by aiming to reduce the need to travel.

3.25 The Regeneration Strategy also identified areas which should have priority for regeneration - parts of the Borough which have specific needs or possess properties which are important to the regeneration of the Borough. In the context of the second Mersey Crossing, this includes South East Widnes, the area lying between the Mersey and Fiddlers Ferry Road.

3.26 The Strategy Background Report pointed out that accessibility to this area has improved with the construction of new roads to Widnes and the riverside canal-side location could be attractive, however, the area has a legacy of contamination and development costs are likely to be high, in addition there is a need for land reclamation. To the south of the river the Astmoor area is not included as an area for regeneration.

Other Initiatives

3.27 A number of feasibility studies(strategies have been carried out, or are in progress, relating to the regeneration of the north bank of the Mersey:

- Halton Water
- Reach Initiative
- Waterfront Strategy

3.28 The Halton Water project was investigated in 1987 by Ward Ashcroft. This considered the construction of a bund in the river running roughly parallel to the shore between West bank and the eastern end of Widnes Warth. This would have impounded a significant area of water which it was intended to use for a variety of water sports including water skiing, power boating, jet skiing and sailing. The scheme would also have incorporated a centre with catering and other facilities. The scheme did not include any significant commercial elements and would therefore have required considerable public funding (in excess of £17m) to proceed. It was not therefore pursued although it is understood that the engineering feasibility was established and several alternative locations for the bund were tested. The boundaries of the Halton Water project were identified in the Halton Local Plan (previously referred to).
3.29 In 1995, consultants Chesterton were commissioned by the Council to prepare a
development strategy for the South East Widnes Employment Area – effectively
the area bounded by the River Mersey, Fiddlers Ferry road and the Shell Green
site. The aim was to recommend how the economy and environment of the area
could be transformed over a ten year period. The strategy proposed the creation of
four distinct development areas which would provide for a range of employment
generating uses. These four zones included:

- the creation of a business park at Shell Green incorporating generous
  landscaping – this has effectively been implemented;

- rationalisation of land uses fronting Fiddlers Ferry Road to release sites for
development, particularly for business starter units;

- redevelopment of the former chemical industry land overlooking the Mersey
  for “bad neighbour” uses (on the more contaminated land at the eastern end)
  and B1/B2/B8 (at the western end);

- development of an area for mixed use (industrial, commercial, non-food
  retail and leisure) focussed on the Bowers Business Park.

3.30 Improvements to the access to the area were considered essential to its
regeneration. These consisted mainly of upgrading existing distributor roads,
supplemented by new internal circulation to serve development plots. No new
strategic links were proposed. The study recognised that the environment of the
area needs greening to improve its image and that even then a focussed marketing
campaign would be required to overcome poor market perception of the Widnes
area in general and the riverside site in particular. While it was accepted that the
economic regeneration of the area should benefit from greatly improved access to
the motorway network via the Widnes Eastern By-pass, there were still felt to be
barriers to investment, not least environmental conditions; the type of industry
present in the area and the physical constraints on much of the land resulting in a
lack of immediately marketable sites.

3.31 The Chesterton study also drew a number of conclusions on development
principles which rejected the concept of development south of the St Helens Canal
or further residential development in the study area.
3.32 The current study being undertaken for the Council by Architects Plus will inform the preparation of a Widnes Waterfront Strategy. The concept of extending the developable area of Widnes into the estuary, though rejected by the Chesterton study, has now received member support and will be tested through further feasibility study work, consultation with statutory bodies and through the Unitary Development Plan process. While the Strategy is still in the early stages of development, it is currently considering a much more commercial approach than the Halton Water scheme, utilising its concept for a bund extending into the estuary, but filling the impounded area to create a development platform for extensive residential development. Other elements being considered include the creation of a "village centre", a band of commercial/leisure uses separating the residential area from existing industry at Moss Bank and a recreation and leisure area based on Spike Island and also extending along the St Helens Canal. New transport infrastructure on an east-west axis would be required to serve the development. It is also being assumed that the second crossing would be in place to create links between the new development and the rest of Halton. The nature of the proposal means that even if potential environmental objections can be overcome, the project will have a lengthy gestation period and the establishment of the development platform will take some considerable time.

3.33 If the Halton Water scheme is rejected as being uneconomic, the question which then arises is the degree to which a second crossing would contribute to the achievement of the other two proposals. The fortunes of the Moss Bank area, the focus for the Chesterton’s study, would be more likely to be improved by the northern end of the crossing terminating close to it. This would raise the profile of the vacant land in the western part of the area, close to the crossing, and may also allow the prospect of creating a direct access from the new road. Together these factors would be likely to increase potential land values which in turn could make redevelopment more viable. Bringing the extensive areas of brownfield land back into beneficial use would be completely in accordance with national planning policies and the Council’s own planning and regeneration policies.

3.34 Were the Widnes Waterfront proposal to prove acceptable in terms of its impact on the estuary, nature conservation and landscape interests, then it would offer the opportunity to create a new neighbourhood within which land use and transport could be properly integrated. The eastern crossing alternative could be perceived as being less attractive in this regard as it would subdivide the developable area. However a road in this position would facilitate access from all parts of the new neighbourhood to the strategic highway network. Given the comments on improving access to key brownfield sites made above, it would also amount to a more robust solution. Promoting a western crossing could result in these brownfield sites remaining peripheral to the new development and being accorded a lower priority for regeneration.
If the new crossing is to contribute to a Widnes Waterfront proposal, then it will be important for the approach road to be as close as possible to ground level as it passes through the area. This will allow easy access to the development site and reduce visual intrusion and other potentially adverse environmental effects on the area.
4. ECONOMIC DEVELOPMENT ISSUES

Introduction

4.1 This Section provides a review of key economic development issues relating to the proposed second Mersey crossing at Widnes and Runcorn. At this stage, the review concentrates on providing:

- a discussion of the principal mechanisms by which infrastructure developments contribute to regeneration;
- a summary of key policy considerations;
- a brief analysis of property market conditions and prospects;
- an audit of development opportunities in relation to the provision of a second crossing; and
- an assessment of existing research findings on the impacts of the crossing on the local and regional economies.

Regeneration Mechanisms

4.2 The benefits and costs attributed to the development of a second Mersey crossing largely can be identified with reference to two key groups, namely:

- Bridge and Transport Network Users; and
- Non-Users/Non Transport Groups.

Bridge and Transport Network User Costs and Benefits

4.3 There are three principal mechanisms by which road bridge and transport network users benefit from the provision of a new piece of infrastructure such as the proposed second Mersey crossing, these are the:

- reduction in the time taken to complete journeys;
- reduction in the level of accidents that occur on the transport network; and
- reduction in the vehicle operating costs associated with user journeys.

Non-User/Non-Transport Benefits of Bridge/Road Network Investment

4.4 Two principal mechanisms are associated with the wider economic impact of bridge/road investment:

- The improvement in accessibility (in journey time, cost, reliability, comfort and safety). This results in extended travel to work and customer catchment areas. Businesses gain from improved choice in the labour market, reduction in inefficiencies caused by travel to work difficulties, and ready access to a larger customer market. The labour force (in and seeking work) gain from extended job choice/employment opportunities.
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- The effect of the road investment on perceptions of investment risk in the benefiting area. Road investment provides a signal of the investment bodies’ confidence in the area and their commitment, in funding the scheme, to securing an adequate return on investment. In turn this enhances the confidence of businesses, residents and property investors in the area so that investment risk is reduced.

4.5 There are two broad effects of these mechanisms:

- development effects, which include:
  - land/property brought into development/redevelopment that would otherwise not have been, or would not have been in the same time scale, or for the same use or the same standard
  - accelerated/enhanced level of lettings.sales of vacant property to end users; and
  - enhanced land/property values
- other economic benefits which include
  - the net gains in direct employment resulting from the development effects together with the associated indirect and induced employment (ie the multiplier effects of the direct gains)
  - increased employment attributable to the expenditure generated by the increased throughput of visitors and customers
  - a reduction in the spatial structural component of unemployment through enhanced accessibility to job opportunities within and beyond the rail corridor and through widening of job search areas;
  - efficiency gains for existing businesses, leading to reduced costs, increased profitability and ultimately increased output (and possibly added employment)
  - the retention of employment which would otherwise have left the area;
  - improved functioning of the labour market through increased participation rates, particularly in the female and part time sectors
  - improved confidence in an area, such that the initial impetus to increased activity provided by the road investment is subsequently built upon in ways only indirectly related to road
  - savings in other expenditure on regeneration which might have been required were it not for the road investment; and
  - increased access to centralised public services (schools, hospitals, local government services and so on) thereby allowing economies through the concentration of their provision.
4.6 The likelihood that bridge/road investment will stimulate these types of economic/regenerative benefits is a function of a number of factors. Where development and wider economic benefits have been achieved certain prior conditions have generally been satisfied, these include:

- the bridge/road produces significant improvements in accessibility, in both peak and off-peak;
- adequate and growing demand by investors and occupiers for new property (and for uses which are sensitive to road access);
- available and developable land in locations suitable for uses sensitive to road access;
- the integration of transport planning with land-use planning early on in the development of a scheme;
- mechanisms for securing 'joint development', that is property developments linked to the scheme and taking advantage of the market and locational advantages;
- the existence of support for the scheme from the public and business community.

4.7 Additionally, development effects and economic benefits tend to be confined to uses which are sensitive to good road access.

4.8 There is a major body of empirical and theoretical research extending over the last 30 years examining the relationship between improvements in transport provision and economic growth. The findings of this work vary in emphasis but the basic premise is that while an operationally effective transport network or an improvement in operational efficiency through the provision of new infrastructure is a necessary condition for economic growth, alone it is not a sufficient condition. Transport access is just one of the factors in the package which determines the location and expansion of economic activity.

4.9 The issue is one of scale. With reference to areas suffering from transport deficiencies the scale of the impact will be influenced by:

- the underlying and unfulfilled economic potential of the area; are there underemployed resources which can be used? Clearly there is often unfulfilled economic potential and underemployed resources in rundown areas, not least labour. Opportunities exist for diversification from the traditional economic base, added value industry, telecoms and services, tourism etc;
- the prevailing levels of accessibility and the degree of improvement offered by the new investment. What is the scale of travel costs and time savings offered, in absolute terms and in relation to the total journey from origin to destination, and to what extent will the reduction in travel costs affect production costs and hence the competitive commercial attraction of the area?
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- the significance of transport costs and accessibility in the package of factors determining location decisions; good transport can be seen as an 'entry qualification';
- the nature of the economic activity - manufacturing, distribution, tourism, etc.;
- the inherent competitive strength of the affected economy; does improved accessibility 'unlock' economic potential?
- the scale of complementary investment. Road investments represent only one element of a package of improvements designed to revive economic prosperity and should be considered in this wider context. Road improvement, as part of a package incorporating marketing/promotion of the area, specific product development initiatives and the stimulation of tourism, would be an ingredient in the success of the overall programme helping to regenerate the area and to prevent its further decline;
- existing perceptions of the area: to what extent does the perception of the area inhibit growth and encourage the migration of economic activity? What part does access to/from and within play in formulating the image of and confidence in the area?

The Halton Economy

4.10 To a large degree, the performance of the Halton economy is dependent on the strength of the wider regional, national and global economies. The local Halton economy has a large proportion of workers employed in manufacturing (see Table below). Consequently, the area is significantly reliant on external trade.

Halton Employment Structure 1996

<table>
<thead>
<tr>
<th>Sector</th>
<th>Halton BC (%)</th>
<th>GB (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agriculture, forestry &amp; fishing</td>
<td>0.5</td>
<td>2</td>
</tr>
<tr>
<td>Energy &amp; water</td>
<td>0.5</td>
<td>5</td>
</tr>
<tr>
<td>Manufacturing</td>
<td>28</td>
<td>18</td>
</tr>
<tr>
<td>Construction</td>
<td>4</td>
<td>7</td>
</tr>
<tr>
<td>Distribution, hotels &amp; restaurants</td>
<td>22</td>
<td>21</td>
</tr>
<tr>
<td>Transport &amp; communications</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>Banking, finance, insurance etc</td>
<td>14</td>
<td>12</td>
</tr>
<tr>
<td>Public administration, education &amp; health</td>
<td>23</td>
<td>24</td>
</tr>
<tr>
<td>Other services</td>
<td>3</td>
<td>5</td>
</tr>
</tbody>
</table>
4.11 The 1997 GDP of the Halton area is estimated to have been approximately £1.3bn or 2.5% of North West GDP\(^5\). During the 1980s, the area enjoyed average rates of economic growth similar to those for the UK as a whole. Despite the relative performance of the local economy, a number of weaknesses can be highlighted:

- with the exception of chemicals, high value added wealth creating sectors are almost entirely under-represented within the local economy;
- local specialisation is predominantly based in below average per-employee GDP sectors; and
- lower value-added sectors account for approximately 60% of estimated GDP.

4.12 With the over-reliance on chemicals and under-representation of high value-added activities, the potential for economic growth is relatively constrained. Consequently, the Borough Council aims to diversify the industrial base through targeted support policies, the promotion of inward investment and the creation of new industries and supply chain in key activities.

4.13 Unemployment rates in Halton have been consistently higher than most other local authority areas in the North West. In November 1999, the claimant count unemployment rate was 5.7% compared to regional and national rates of 4.8% and 4.1% respectively. With regard to relative deprivation, Halton is ranked 19th out of all local authority districts in England. In the North West, only Liverpool, Knowsley, Manchester and Oldham are ranked more highly in terms of overall deprivation. The wards of Castlefields, Kingsway and Riverside display particular structural difficulties.

4.14 The relative disadvantage of the Halton economy is reflected by its inclusion in the designated Objective 2 area of North Cheshire and Intermediate Development Area (UK Regional Selective Assistance).

**Policy context**

4.15 The economic assessment of the merits of a second crossing has as its context a number of policy documents, prepared at both regional and national level. Following the establishment of the Regional Development Agencies and local government reorganisation, these are currently undergoing a process of review. References to economic considerations are summarised below, with further information on key policy documents included in the Planning Context section of this report.
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North West Regional Economic Strategy

4.16 The Regional Economic Strategy prepared by the North West Development Agency highlights the strategic importance of a second Mersey Crossing to the regeneration of localities such as Widnes and Runcorn. A primary objective of the strategy is to strengthen strategic communications and to invest in infrastructure:

"Investing in infrastructure deals with physical assets which underpins the issues of economic growth, employment and social inclusion including...transport and communications".

4.17 The Mersey Crossing at Runcorn is designated by the NWDA as a strategic internal route to a key regeneration area with particular difficulties including congestion, poor road safety and poor environmental conditions. Furthermore, it is recognised that infrastructure works may be needed to open up new development sites.

Regional Planning Guidance

4.18 The Consultation Review of the 1996 Regional Planning Guidance for the North West identified the Mersey Belt as one of the major conurbations for the focus of future economic development activity. Runcorn and Widnes both lie within the defined Mersey Belt area. The Draft Regional Planning Guidance for the North West\(^7\) (July 2000) confirms the importance of the Mersey Crossing at Halton within the Region as a Strategic Access Route, and identifies the proposed new crossing as a Transport Proposal of Regional Significance.

Halton BC Policies

4.19 Major Objective 7 of the Halton Local Plan\(^8\) aims to promote new schemes, especially a second road crossing of the Mersey. This is considered urgent with a view to maximising development opportunities on the river front and reduce congestion on the Widnes/Runcorn bridge;

1.1

1.2 Regional Planning Guidance Review: Choices for the North West, Consultation on Strategic Options for the region, NWDA, October 1999.

1.3 Draft Regional Planning Guidance for the North West – People. Places & Prosperity, July 2000, North West Regional Assembly

1.4 Halton Local Plan, Adopted April 1996.

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4.20 Key Challenge Three of the Borough's Economic Development Strategy highlights the need to improve transport infrastructure to facilitate the expansion of new employment in the Borough. This emphasises the fact that congestion on the existing bridge detracts from the positive image necessary to attract investment to Halton;

4.21 The Regeneration Strategy for Halton emphasises the need for de-congestion and improved access to improve economic development prospects of key derelict and vacant sites, particularly around the waterfront.

4.22 Halton Interim Local Transport Plan (1999) stresses that congestion on the Silver Jubilee Bridge is a constraint on the economic development of the sub-region. It is stated that the crossing has become essential to the commercial well being of the local economies of Runcorn and Widnes, the Merseyside Objective 1 area, and a major part of the North Cheshire designated Objective 2 area.

Existing Research

4.23 The economic development opportunities arising from a new crossing, or alternatively the damage that may occur to the local economy in the absence of a new crossing is a key issue for the Mersey Crossing Group. Two main studies were commissioned to examine the extent to which crossing options would encourage and facilitate economic development on both sides of the Mersey in the widest possible area, including Merseyside, Runcorn, Widnes and North Cheshire:

- DTZ Pidea (as sub-consultants to Oscar Faber);
- Liverpool Macroeconomic Research Ltd.

4.24 DTZ Pidea provided an assessment of the possible employment impacts of the Stage 2 crossing options (western, central and eastern) based on the performance and decisions of existing firms, obtained from a business survey (interviews and questionnaires), and from an assessment of the ability of key employment sites to attract new investment.

1.1

1.5 Halton Borough Council: Economic Development Strategy 1999

The business survey was undertaken as part of Stage 2 in order to determine the potential economic impact of a new crossing or the 'do-nothing' scenario. In particular, the survey sought to identify the impact on local businesses of congestion associated with the existing bridge, the perceived advantages of a second crossing and the preferred location of a new bridge. The survey represented a 16% sample by number of firms (and 20% by employment)\(^{11}\). It was emphasised that a multiplicity of factors affect the development and performance of existing firms and the attraction of new investment. Consequently, it was stressed that alleviation of current and future congestion on the existing bridge is only one determinant on employment change in the area.

It was concluded that building a new crossing would make a significant contribution to the safeguarding or creation of approximately 3,000 jobs in existing firms in the area (representing an increase of 3.3% on 1995 employment levels).

DTZ Pieda estimated that there are approximately 320 hectares of developable employment land in the area of influence (210 if sites smaller than 7 hectares are excluded). A large amount of the employment land is concentrated in two key locations – Manor Park (Runcorn) and around Liverpool Airport (sites developed by the Speke Garston Partnership). It was stressed that the alleviation of congestion on the existing bridge is one of several factors influencing the marketability of the sites and ability to attract new investors and occupiers. Taking into consideration factors including constrained land, displacement and deadweight, it was concluded that the creation of a new crossing could contribute to the development of up to 11,000 to 17,000 net new jobs in the area on new sites. On the basis of the proportion of survey respondents considering relocation because of congestion (10%), it was estimated that 1,100 to 1,700 new jobs from inward investment over a 10-15 year period could be specifically ascribed to the benefit of a new crossing.

It was also concluded by DTZ Pieda that there would be little differential impact between the three options. However, the distribution of employment impact would differ marginally between options with the western option delivering approximately 500 more jobs to the South Liverpool/Knowsley area than other options.

\(^{11}\) The area of influence was defined primarily as within 10 miles of the existing crossing and confined to Halton, South Liverpool and South Knowsley.
4.29 LMR Ltd were commissioned to model the economic impact of a new Mersey Crossing using existing simulation models of the Merseyside and Cheshire economies. The model tested two of the Stage 2 options and one of the options considered in the original Department of Transport Study (also included the impact of public transport measures). The study was commissioned following a Ministerial request for additional information with regard to the economic and employment impacts of a new crossing and the potential for public transport improvements.

4.30 The impact of each option on the economies of Merseyside and Cheshire were derived by inputting the transport cost saving generated by each scheme into the economic models. The model simulations then generated percentage point changes in four economic variables: GDP, employment, working population and unemployment, on an annual basis over a period of 17 years. Each of the econometric tests were run on the basis of ‘with’ and ‘without’ public transport measures.

4.31 The original western crossing option was forecast to perform significantly better than the local crossing options and would result in an increase in GDP of £281 million and create 5,500 jobs. Of the two local options considered, the local eastern option performed best (70% of GDP forecast for original western crossing and 60% in terms of employment).

4.32 The ‘with’ public transport tested resulted in slightly lower benefits than those forecast for the ‘without’ public transport tests. However, the tests did not include an assessment of the economic impact of additional patronage on public transport services.

4.33 It was also forecast that a new crossing would have a greater impact on the Cheshire economy than that of Merseyside. This was attributed to the fact that the Cheshire economy is more receptive to cost savings than Merseyside.

Property Market Conditions and Development Opportunities

4.34 The distribution of development activity is heavily skewed in favour of areas south of the River Mersey, in particular the area around Manor Park and Daresbury, as noted above. As the Economic Development Strategy notes, some 70% of sites identified in the Halton Local Plan were in Runcorn. A further differentiation is that almost all the sites with development potential in Runcorn are greenfield sites and relatively unconstrained, whereas the majority of “available” sites in Widnes are classified as brownfield and their development would be likely to incur additional costs. The UDP process will seek to address this imbalance by identifying less constrained sites in Widnes, though these are likely to prove controversial in some cases. For example, a site is being sought for a business park on the northern edge of Widnes which would be able to benefit from good access to the motorway network.
The need to identify new sites for economic development in Widnes has been
stimulated by a number of factors. Firstly, the majority of recent job losses in
Halton have affected companies on the north side of the river in the traditional
manufacturing and chemicals sectors. Secondly, economic initiatives taking place
outside the borough boundaries are likely to lead to an increasing daily movement
of workers. High levels of investment in the Speke/Garston area, underpinned by
European funding, have resulted in the relocation of companies to the area and
expansion in the pharmaceutical sector and financial services. The Omega
strategic employment site to the north of Warrington is also due to come on stream
shortly, following approval of a new junction on M62. To the north west of
Widnes, the "Halewood Rectangle" has been identified as an area of investigation
for another strategic site. All these major sites are within a relatively short
distance of Widnes. Thirdly, as noted above, the quality of existing development
sites in Widnes is poor. Fourthly, the unpredictability of the existing bridge
crossing acts as a deterrent to journeys to work by Widnes residents seeking to
access job opportunities south of the river.

The principal employment development site in Widnes is at Shell Green. Although
the site has good road access, modern infrastructure and good landscaping, it has
failed to attract occupiers. Its location adjacent to the waste incinerator and coal-
fiired power station, and close to various chemical manufacturing companies, may
have weighed against it when being considered for business use by potential
investors.

Although there has been some limited take-up of allocated employment sites in the
Moss Bank area, this has been by relatively low value uses related to the existing
chemicals sector. Serviced vacant sites also remain off Dennis Road, even though
these are directly accessible from (and in some cases have a frontage to) the
Widnes Eastern By-pass. There remain large tranches of former industrial land
lying vacant in the Moss Bank area and which require extensive remediation
before they become available for redevelopment. Further reference is made to
these sites in the Planning and Land Use section of this report.

Most development activity has occurred in the town centre with the development
of facilities such as the new market, Morrisons supermarket and associated retail
and leisure uses. This will be further stimulated by the SRB Round 5 programme
"Focus for Change" which has £25m budget aimed at supporting local
communities and providing education and training initiatives and improved access
to health care. In addition, the Council has a joint venture vehicle with developers
St Modwen which is promoting the comprehensive redevelopment of the south
side of the town centre based around a new Asda supermarket. The planning
application has been called in by the Secretary of State and a public inquiry is due
to take place in May 2000. St Modwen also own the former ICI laboratories off
Waterloo Road, which have redevelopment potential, not yet realised.
4.39 To the west of the existing bridge crossing lies the West Bank Dock Estate which still suffers from poor environmental conditions and the need to undertake site remediation before development can take place. As a result there remain vacant plots, despite recent improvements to the highway network on the south side of Widnes which have improved its accessibility.

4.40 Further west still, the former British Rail depot at Ditton Junction has planning permission for employment uses. ERDF funding should enable an access to be created from the roundabout at the southern end of the Knosley Expressway which will stimulate the development of this 58 acre site. The nearby former Golden Wonder factory has recently been bought by developers and any redevelopment proposals should also benefit from proximity to this junction, which provides high quality access to the motorway network.

4.41 In summary therefore, the market north of the river remains depressed, with the exception of the retail and related leisure sectors. Despite much improved road access, poor environmental conditions and exceptional development costs combine to deter would-be investors.

4.42 South of the river the picture is altogether different. The Astmoor industrial estate, provided as part of the New Town, had been in decline, but is now attracting new investment and many of the older properties are being refurbished. There is evidence of new business units and factory building. Further east, allocated sites at Daesbury and Manor Park are now being developed and in the region of 7000 new jobs are projected.

4.43 Manor Park 3 is a development site owned by English Partnerships and is being actively marketed for B1, B2 and B8 uses. Office, research, large scale manufacturing and distribution uses are being targeted. The site has already attracted a development by Business Post and a distribution centre for Lidl supermarkets, with the frontage to Daesbury expressway being promoted for office development and call centres. Approximately 100 acres remain for development and the intention is to create a high quality environment to complement the earlier phases of the Manor Park development.

4.44 Daesbury Park is a 200 acre site, the first phase of which is under construction. The site is identified as a strategic site by the North West Development Agency and is intended to be developed as a high quality office park offering space for headquarters functions and similar prestigious occupants. The strengths of this site lie not only in its proximity to Junction 11 of M56, but also to its accessibility to Manchester Airport and marketing is therefore aimed at both national and international companies. Some 40,000 sq ft of speculative office space is being developed as part of the early development phases, along with a hotel and site infrastructure.
4.45 It had been hoped to attract the £150m Diamond Synchotron project to a site at Daresbury Laboratories. However it has recently been announced that this project will be located near Oxford. While the project would not have generated significant new employment, it would have been highly prestigious and improved the prospects for development at Daresbury Park by stimulating "spin-off" developments in the high technology sector.

4.46 Elsewhere in Runcorn, two other significant economic projects involve the redevelopment of the former ICI offices at The Heath and the docks at Weston Point. The former scheme is already underway on a phased basis and provides managed office space through refurbishment. One focus is on the development of an International Business Centre aimed at providing a gateway for US companies wishing to access the European markets. Interest has also been expressed by call centre operators and training companies and by ICL for a Census processing/archiving centre. This site has direct access to the Runcorn Expressway. At Weston Point, owners British Waterways have aspirations to develop a warehousing and distribution centre with a particular emphasis on bulk handling. The site is rail served and it is proposed to establish an improved access from the Expressway, which has been the subject of a bid for grant assistance.

4.47 Within the central area of Runcorn, a number of other development opportunities are being promoted by the Council and the Halton Partnership, such as the former Crossville depot (proposed for leisure uses) and the Camden Gardens site (arts centre). Grant approval has recently been received for the Arts Centre and the proposal is no being taken forward. Other sites remain in abeyance, pending developer interest or availability of funding. A large site adjacent to the Ship Canal west of the Dukesfield residential area is proposed for comprehensive development for new buildings for Halton College and for residential development. Site acquisition and infrastructure costs are being met from the Single Regeneration Budget, but it is understood that implementation awaits a decision by the College.

4.48 In summary therefore, economic development activity is proceeding well in the M56 corridor where the combination of greenfield sites and good motorway access is attractive to developers and potential occupiers. Elsewhere in Runcorn, progress on economic development projects is more mixed, with issues other than accessibility currently delaying implementation.

Conclusions

4.49 The provision of a second Mersey crossing would accord with economic development policies at regional and local level.

4.50 The main economic benefits are considered to relate to:

- A reduction in business costs due to reductions in delay on the existing bridge and shorter journey times on some trips, particularly between north east Runcorn and the eastern side of Widnes.
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- Improved access to employment opportunities in the M56 corridor (Manor Park and Daresbury) for residents of Widnes. The development of these areas continues apace and both areas should be well established by the time a crossing would come into operation. Together with the Astmoor area they will provide a significant number of jobs. Equally, employers in these growing areas will be able to draw upon a wider labour market.

4.51 The significant investment which the second crossing would imply should boost confidence in the area generally and should help to change perceptions of private sector investors. It is therefore likely to stimulate activity in the property market.

4.52 The benefits of a second crossing, in terms of increased land values and development activity, will be felt more strongly on the north bank of the Mersey and would be enhanced if supported by a package of other measures designed to remove the other constraints to development, notably environmental conditions and problems of ground contamination.
5. PUBLIC TRANSPORT AND MODE SPLIT ISSUES

Introduction

5.1 The use of public transport for bridge crossing movements is an extremely important issue, and we have therefore examined the current situation, in terms of provision, usage, and modal split, in some detail.

5.2 It is important that public transport accessibility across the river is enhanced for two main reasons –

- To encourage a significant proportion of those with a car available to use public transport instead of private car, so as to reduce congestion and minimise air and noise pollution caused by car-borne movement
- To reduce the perceived severance between the two parts of Halton, for those without access to a car, which the river represents

5.3 In order to assess the necessary public transport measures which will need to be incorporated into the overall river-crossing package, it is important to have a detailed understanding of the present usage of public transport.

5.4 Because of the longer journey times and distances involved in trips which do not start and finish within Halton, the analysis set out in this Chapter concentrates on movements which are wholly within Halton. These are likely to form the majority of trips for which public transport provides an attractive alternative to the car, and are of the greatest interest to Halton Borough Council.

5.5 Rail does, of course, provide a link between Runcorn and Liverpool City centre. At present, generally two trains per hour call at Runcorn en route to London Euston or Birmingham and Stanstead Airport. However, the services operate within a few minutes of each other, so there are often 50-minute gaps in the combined service to/from Liverpool. The Borough Council is currently undertaking a study into rail facilities within Halton with a view to enhancing rail passenger services.

5.6 Four main strands of analysis contribute to the assessment set out in this Chapter –

- analysis of the roadside interview data as a source of the level of car-borne movement within Halton
- analysis of the bus passenger interview data as a source of information on the use of buses by those with and without the availability of a car
- analysis of bus timetable and routing information as a source of bus availability, frequency and journey time.
- Extraction of information from the SATURN model regarding journey times for trips made by car, for comparison with bus journey times.
5.7 The zoning system used for the SATURN model is described later in this report. This level of division of the Borough provides a useful basis for presentation of information on bus travel and for comparison with movement by private car. Within Halton, the system provides 15 zones on the Runcorn side of the river, and eleven on the north bank.

5.8 Table 5.1 includes some overall summaries of bus usage in Halton, taken from the analysis of the bus surveys. As indicated previously, 255 bus passenger ‘groups’ were interviewed during the surveys. Unfortunately, in a significant number of the surveys, ‘Runcorn’ or ‘Widnes’ was recorded as the trip start or finish point (rather than a more precise address). This occurred in the case of 35 origins and 52 destinations. These general locations have been allocated to the zoning system in the same proportions as complete addresses recorded for other interviews using the same bus service, however, this process must increase the confidence interval which should be applied to the various tabulations which, inevitably, are based on a small sample of interviews taken on a particular day.

5.9 Table 5.2 sets out the origin and destination zones of bus trips by each bus service, over the day as a whole. The table identifies –
- The importance of Runcorn High Street, Brookvale\textsuperscript{12}, Castlefields\textsuperscript{13}, Boston Avenue, and Halton Lea as trip origins for cross-river journeys by bus, and
- The importance of the Victoria Square area, Widnes centre (Green Oaks area), Warrington, and Central Liverpool as destinations
- The relatively low use of buses for trips to the suburban parts of Widnes

5.10 Table 5.3 tabulates the actual zone to zone movements undertaken by bus passengers during the morning peak period, the off-peak period, and the evening peak period. Generally speaking, the individual movements are too small to draw any specific conclusions.

Modal Share

5.11 We have previously identified that about 2700 passenger group movements are made by bus each day across the bridge (both directions combined). Table 5.4 brings together information on cross-river movements by private car and by bus - and also, of those using the bus, the number of groups indicating that they had a car available for the trip. It indicates that over 72,000 people ‘groups’ (cars) cross the river in a typical weekday – that is, bus passengers constitute only 3.5% of people crossing the river, overall. (The areas used in the table are combinations of the zones as shown in Figures 11.2 and 11.3).

1.1

\textsuperscript{12} The Brookvale zone includes Murdishaw and Palace Fields.

\textsuperscript{13} The Castlefields zone includes Halton Village.

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5.12 Table 5.5 presents information just for movement within Halton. Cars provide the means of transport for 15,700 passenger groups, with buses carrying 1760 movements - buses thus carry just over 10% of bridge-crossing passenger movements wholly within Halton. The final part of the table indicates the number of bus passengers who indicated that they had a car available for their journey but, nevertheless, chose to make their trip by bus. The 450 car-available passengers who used the bus represent just 2.8% of people who had a car-available for their journey (the other 97.2% choosing to use their cars).

5.13 Table 5.6 presents the same information but at a zonal level with the rows and columns of the tables sorted to emphasise the major differences in modal split which are achieved by different zones in the Borough (for cross-river movements).

5.14 The rows of the tables are arranged with the zones with the highest proportion of movements by bus nearest the top, indicating that

- over 15% of cross-river Halton trips starting in Runcorn High Street, Castlefields, and Bridge Street are already made by bus,
- less than 5% of those commencing in Westfield, Preston Brook\textsuperscript{14}, or Weston Village are made by bus
- over 25% of Halton cross-river journeys terminating in Victoria Square are made by bus
- but less than 5% of cross-river trips to Hale\textsuperscript{15}, the Ball O'Ditton area, or the Tan House Lane area are made by bus.

5.15 Clearly, some zone to zone movements are too small to enable public transport to be provided effectively, so the information in Table 5.6 has been re-presented in Table 5.7. Whilst the percentages still represent the proportion of trips undertaken by public transport, the type face indicates the size of the overall movement - a blank indicates no movements recorded, and a dash means that the daily movement is under 150 persons per day. Standard type face indicates a zone to zone movement of between 150 and 200 people, bold typeface indicates 200 to 280 movements, and bold/italic represents zonal movements of 350 to 650 people per day. The table thus identifies the 28 zone to zone movements where public transport has the greatest potential to influence modal split. The movements can be categorised as follows (and are shown in Figure 5.1):

- Large movements (350 to 650 per day) for which bus is already a significant mode (30 to 69%)
  - Brookvale to Victoria Square
  - Runcorn High Street to Widnes Centre

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\textsuperscript{14} The Preston Brook zone includes the Whitehouse Industrial area.

\textsuperscript{15} The Hale zone includes Halebank.
* Moderate movements (200 to 280 per day) for which bus is already a significant mode (25 to 60%)
  - Castlefields to Victoria Square
  - Runcorn High Street to Victoria Square
  - Windmill Hill\(^{16}\) to Victoria Square
  - Castlefields to Lower House Lane area

* Large movements (350 to 600 per day) for which bus is used by some people (8% to 20%)
  - Boston Avenue to Widnes centre
  - Castlefields to Widnes centre
  - Halton Lea to Victoria Square
  - Brookvale to Widnes centre
  - Halton Lea to Widnes Centre

* Moderate movements (200 to 280 per day) for which bus is used by some people (5 to 20%)
  - Beechwood to Victoria Square
  - Higher Runcorn to Widnes centre
  - Brookvale to Crow Wood
  - Boston Avenue to Victoria Square
  - Boston Avenue to West bank
  - Windmill Hill to Widnes centre
  - Boston Avenue to Lower House Lane
  - Halton Lea to Lower House Lane

* Larger movements (350 to 400 per day) for which bus is used by few people (less than 1%)
  - Boston Avenue to Ditton
  - Beechwood to Widnes centre

* Moderate movements (200 to 280 per day) for which bus is used by few people (less than 4%)
  - Brookvale to Farnworth
  - Halton Lea to West Bank
  - Halton Lea to Farnworth
  - Higher Runcorn to West Bank

\(^{16}\) The Windmill Hill zone also includes the Manor Park and Sandymoor areas to the east.

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- Brookvale to Ditton
- Halton Lea to Crow Wood
- Brookvale to the Ball O’Ditton area

5.16 In order to shed some light on why the bus mode split differs so much between the top two groups and the bottom two groups, we have carried out extensive analysis of bus frequencies, the need to change services in order to complete one’s journey, and journey times by bus and by car.

5.17 We have extracted detailed information from the bus timetables in order to allow us to construct a tabulation of the accessibility by public transport of all zone to zone movements in the Halton area. Services 14, 30, 32, 61, 62, and 110 which provide cross-river services within Halton all call at Halton Lea, Runcorn High Street, Victoria Square ( Widnes Town Hall), and the Green Oaks Shopping Centre in Widnes. Passengers travelling between zones served by these services can make cross-river journeys without the need to change buses.

5.18 In addition to these services, other services which do not cross the river also operate within Halton. On the south bank of the river, services 6, 13, 20, and 20b each provide at least an hourly service linking various parts of Runcorn with the High Street bus station; similarly, services 2, 12, 13, 26, and 28 link various parts of Widnes with Victoria Square. Passengers who do not have access to a direct cross-river service can use one of these routes to travel to Runcorn High Street or Widnes Victoria Square, and use one of the cross-river services to complete their journey. Tables 5.8 to 5.10 summarise the available services calling at each zone on the Runcorn bank and at each zone on the Widnes bank. The tables indicate the number of buses calling per hour in the morning peak, off-peak period, and evening peak. The in-bus time (from boarding the bus to alighting from the bus) is also shown, together with an estimate of average waiting time at the boarding stop, based on the service frequency.

5.19 This information is combined in Table 5.11 to give overall estimates of average journey time (from arriving at the boarding stop to alighting at the destination stop) for each zone to zone movement. That information is shown in the right part of each table (blanks in the table indicate movements for which there is no practical connection by bus). The left part of the table indicates the overall number of buses per hour available for the particular zone to zone movement, together with the letter ‘D’ indicating that the journey can be made directly; ‘C’ indicates that a change of bus is required.

5.20 Interrogation of the SATURN traffic model allows us to determine typical journey times by car for zone to zone movements in Halton. Table 5.12 brings together information about bus journeys and car journeys for a sub-set of zone to zone movements.
5.21 The upper set of movements are those where the 1999 surveys indicates that there were moderate or high total movements, and a high proportion of these trips were made by bus (most are associated with Runcorn High Street or Victoria Square). The middle set of movements are also made by a moderate to high number of people on a daily basis, but virtually none of the trips are made by bus (most of these are associated with Halton Lea and adjoining residential areas, and with suburban Widnes).

5.22 The third set of movements are large in total trips per day, and a moderate proportion are carried out by bus – most of these are associated with Widnes Town centre.

5.23 A comparison of the characteristics of these movements may shed some light on the markedly different modal splits achieved, enabling us to make recommendations which will protect the high mode split achieved by the first group, significantly increase the mode share achieved by the second group, and maintain and enhance the mode share achieved by the third group.

5.24 Examination of the table suggests that, generally speaking, a significant mode share by bus can be achieved, in cases where –

- A direct bus service is available
- A service frequency of more than about 8 buses per hour is provided
- the bus journey time is significantly less than twice the car journey time

5.25 Clearly this is an oversimplification, and the table includes instances where the bus mode share is high though the criteria are not met, and others where bus share is low despite the criteria being met (in the case of West bank, it is probable that the main demand from the Runcorn bank is to locations in the industrial part of the model zone much of which is a considerable distance away from the parts of the zone which are well-served by bus).

5.26 The timings shown in the table relate to the morning peak period, when significant congestion increases car journey times. Bus journey times are protected from this congestion to a significant degree by the presence of bus lanes on the approaches to the Silver Jubilee Bridge.

5.27 In the future (with two bridges in place) congestion should be removed and (for some movements) car drivers may have a much shorter route available to them. Based on current routings, bus journey times may then be significantly longer than car journey times for certain movements. However, the second bridge would be connected directly to the innovative Runcorn Busway via a new busway link at Castlefields and busway lanes to the main section of the new bridge. In Widnes, a new section of busway would provide direct links to the local bus network. This will provide the opportunity for new and re-routed bus services to directly link Eastern Runcorn with Widnes.
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5.28 Clearly, in a de-regulated system, the local authority has relatively little direct influence over bus routing and frequency, however, the proposed extension of the Busway concept into Widnes via the new crossing will provide excellent opportunities for bus operators to provide services which both car-owners and those without a car available will find attractive.

Conclusions

5.29 In general terms, therefore, we would see both bridges operating in combination to provide frequent cross-river movements – trips associated with Runcorn High Street (and western Runcorn) and with Victoria Square (and West Bank) continuing to use the Silver Jubilee Bridge, but with services providing more direct routing between Halton Lea and surrounding residential areas on the south bank, and Widnes Town centre and suburban area on the north bank being enabled to use a new crossing in an efficient manner.

5.30 However, we must not lose sight of the fact that the majority of bus users in the Halton area are NOT making journeys across the river (even on the non-river crossing sections of the cross-river services), so it is important that measures to attract more cross-river trips to public transport are not implemented in a way which actually disadvantages or makes less attractive public transport movements within Widnes, and within Runcorn.

Walking and Cycling

5.31 There are no objective measurements of the numbers of people crossing the Silver Jubilee Bridge on foot or by cycle. However, casual observations indicate that the numbers are relatively small.

5.32 The present footway (which cyclists also make use of) is relatively narrow. On the bridge itself, it is located 'outside' the structure, and some pedestrians may find the arrangement off-putting. On the approaches to the bridge, the footway is located immediately adjacent to the carriageway which, given the heavy traffic flows and significant (off-peak) speeds can be intimidating. On the Widnes Bank, at-grade connections are provided into Irwell Street for access to West Bank. On the Runcorn Bank, pedestrians must walk as far as Greenway Road before being able to leave the footway and link into Runcorn Town centre.

5.33 Foot and cycle journeys can have several purposes – journeys to work, shopping or school, or leisure trips including exercising dogs.

5.34 The principal leisure routes and destinations in the area consist of the Trans Pennine Trail on the Widnes bank – this makes use of the St Helens Canal towpath and passes adjacent to the Spike Island park, boating activity, and the Catalyst Museum. On the Runcorn Bank, the Bridgewater Canal towpath forms another east-west leisure facility. Linkage between the Trans Pennine Trail and the Bridge footway are indirect and unsigned, as are routes from the Bridgewater Canal towpath to the Bridge footway.
5.35 As regards non-leisure trips, journeys on foot between West Bank and Runcorn Town Centre are possible, but linkages to Widnes Town Centre or the Astmoor Industrial Estate are probably regarded as too long for regular work journeys.

5.36 Through careful design (particularly if the new crossing is at a low level), the walk across the new bridge could be made an attractive leisure route in its own right, and this would be significantly enhanced by direct connections to the Trans Pennine Trail and Bridgewater Canal towpath. Similarly, depending on the final bridge location, it should be possible to provide an attractive route for Runcorn Town residents to walk or cycle to employment in the Tan House Lane area of Widnes, and for some Widnes residents to reach employment opportunities in the Astmoor Industrial estate by foot or cycle.
6. FUTURE TRAFFIC LEVELS

Introduction

6.1 The procurement of a major project such as a new crossing of the River Mersey will involve a number of significant and time consuming procedures that will need to be undertaken by the Local Authorities. These procedures include the planning process, financing of the project, engineering design, a significant number of administrative and procedural processes and a significant construction phase. The approach to each of these procedures will have an impact on how the development of a second Mersey Crossing proceeds. However one of the most significant of these procedures to be defined at an early stage is the question of how this crossing is to be procured and most importantly financed.

6.2 Chapter 14 of this report goes into some detail regarding this subject but it is felt that one of the possibilities for procurement and financing needs to be highlighted at this stage. Chapter 14 shows the quite large range of possibilities for progressing a new piece of highway infrastructure that are available in the UK at the moment. However when it comes to financing an estuarian crossing such as this one, one of the most important questions is whether the users of this crossing will be provided with a free service or will they be expected to pay a toll, whether the funding of the project has been through Public or Private means.

6.3 To allow the evaluation of the needs of the corridor to take account of this we have made two basic assumptions within our forecasting, one that assumes free crossing of the Mersey and one that assumes the introduction of user charging through direct tolling.

Selection of ‘Design’ Year

6.4 For the purpose of the assessment of transport demand, we have assumed that a new bridge could be in place by 2010. It is standard practice to consider the operation of new infrastructure 15 years beyond its opening date (and to design the route to accommodate the expected demand at that date) so as to ensure a reasonable balance between having excessive capacity in the early years of operation of the facility, and ensuring a reasonably long useful life for the works.

Growth Forecasting Methodology

6.5 In addition to developing forecasts of traffic demand for an opening year of 2010, we have thus also produced forecasts for 2025. The DETR produce predictions of growth in trip ends at District level and these predictions are commonly used as a constraint in developing local traffic models. In the case of cross-river traffic at Halton, future growth in road traffic is likely to be affected by the level of congestion and, if a new crossing is provided under a funding mechanism which requires the introduction of direct tolling, as outlined in Chapter 14, this will also act to depress demand below the level of flow which might be attracted if an uncongested, untolled river crossing was available.
6.6 In order to simplify the number of different forecasts used in the analysis, we have
developed just two sets of future trip matrices:

- **Constrained Forecasts** which we have assumed would apply equally to
  
  - a ‘Do Minimum’ situation – where the existing crossing remains the
    sole crossing in the area, it is toll-free, but suffers increasingly from
    congestion
  
  - a ‘Do Something’ Situation – in which a second crossing is provided,
    and both crossings have tolls (we have thus assumed that the impact of
    tolls on demand will be generally similar to the impact of congestion)

- **Unconstrained forecasts** which might be applicable in a situation in which
  an additional bridge was provided, but both crossing were operated without
  tolls.

6.7 The DETR District Trip End Growth Predictions provide growth predictions based
on the lower and upper ends of a range of economic growth, and car ownership
and use (see Table 6.1). In general terms we have assumed that (insofar as traffic
crossing the river is concerned), congestion or tolls will limit traffic growth for
most movements to the lower end of the Trip End Projection range.

6.8 However, there are a number of zones within the modelled area where a significant
amount of development is expected to take place in the foreseeable future, and
where the application of ‘low’ growth would clearly underestimate the likely
situation. For a small number of zones, therefore, we have applied the ‘high’
growth factor. These selected zones are as follows:

- Zone 1 - Runcorn High Street (to allow for Runcorn on the Mersey SRB and
  other related developments)
- Zone 3 - Runcorn Station (to allow for increasing emphasis on public
  transport)
- Zone 4 - Westfield (to allow for expected development between Runcorn
  Docks and the town centre)
- Zone 13 - Widnes Hill (to allow for expansion at Sandymoor and Manor
  Park)
- Zone 16 - Widnes Centre (to allow for major development proposals in the
  Widnes Road /Simms Cross area)
- Zone 18 - Farnworth (to allow for continuing housing expansion in the
  Upton Rocks area)
- Zone 20 - Tanhouse Lane – reflecting the availability of additional land for
  industrial expansion at Tanhouse Lane and Gorsey Lane industrial estates
- Zone 21 - West Bank – reflecting the availability of under-used industrial
  land in this area
- Zone 25 - Hough Green – reflecting continuing housing expansion to the
  east of the area
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- Zone 38 - Liverpool South – recognising the expected level of development in the Speke-Garston area.

6.9 Factors applying to each zone are shown in Table 6.2.

6.10 We have also applied some reductions to the matrix to reflect the expectation that growing congestion, or the introduction of tolls, will cause certain movements to divert away from the Halton area and use other river crossings. Three groups of movements have been identified (zones affected are shown in Table 6.3) –

- Traffic with its northern trip end north of M62 or in East Liverpool and its southern end served via M6 south of M56 or M56 east of M6 – 50% of this traffic has been assumed to divert from the Halton area to M6 Thelwall viaduct

- Traffic with its southern trip end in an area served by M56 west of Halton or in Frodsham, and it northern end served by M6 north of M62 or M62 east of M6 – 50% of this traffic has also been assumed to divert to M6 Thelwall viaduct

- Traffic with its northern end in Inner or Northern Liverpool and southern end in the Wirral, Chester, or North Wales – 33% is assumed to transfer to the Mersey Tunnels.

6.11 A final reduction has been applied to reflect the modal shift in favour of bus movement that congestion may bring about in the base situation, and that tolls and additional bus priority might effect in a two-bridge situation. The analysis set out in the previous chapter has shown that about 2.8% of drivers with a car available to them are currently choosing to use the bus for journeys wholly within Halton. This blanket percentage hides a degree of variation between various areas within the Borough. We have applied factors to various cells of the trip matrices on the assumption that the overall package of measures will be able to bring about a doubling of the proportion of car-available trips actually carried out by car to 5.6%. In order to effect this change, various cells within the matrix have had a factor in the range 0.944 to 1.000 applied to them (as shown in Table 6.3).

6.12 The overall impact of our growth assumptions is that the current level of traffic demand of around 79,000 vehicles per day is predicted to grow to about 101,000 vehicles per day in 2025 (constrained forecast) or 112,000 vehicles per day (unconstrained forecast) – as shown in Tables 6.4 and 6.5. The constrained forecasts are shown diagramatically in Figures 6.1 and 6.2.

Carriageway Width for a New Crossing

6.13 Clearly, at a flow level of 79,000 vehicles per day, the current bridge is carrying significantly more than will allow a reasonable level of service to be provided. At present the highest directional hourly flow demand is approximately 3800 vehicles per hour. Assuming that peak hour demand increases in line with the all-day growth in traffic, by 2025 the peak hour directional demand will be of the order of 4900 to 5400 vehicles.
6.14 TA79/99 – Traffic Capacity of Urban Roads (part of Volume 5 of the DETR Design Manual for Roads and Bridges) sets out the hourly ‘capacity’ of a range of urban road types. In the context of TA79/99 ‘capacity’ is defined as the maximum sustainable flow of traffic passing in 1 hour, under favourable road and traffic conditions. The capacity per direction of the highest standard of single carriageway (roads with grade separation) is indicated as –

- 2550 vehicles per hour (12.3m carriageway width)
- 2800 vehicles per hour (13.5m carriageway width)
- 3050 vehicles per hour (14.6m carriageway width)

6.15 The carriageway width on the bridge is close to 12.3m, so we have assumed that it would be desirable to seek to reduce the demand for movement across the existing bridge to 2600 vehicles per hour (one-way). This is approximately equivalent to 55,000 vehicles per day (2-way). Given the expected level of demand by 2025, a second crossing would need to attract 45,000 to 55,000 vehicles per day (2-way), or around 2300 to 2800 vehicles per hour (peak direction), if congestion on the Silver Jubilee Bridge is to be completely removed.

6.16 TA79/99 indicates that the capacity of a standard 7.3m single carriageway with limited access is 1590 vehicles per hour (in each direction). A 10m carriageway would have a capacity of 2010 vehicles per hour. However, the advice note assumes that the peak hour flow will have a 60/40 tidality and thus permit some overtaking in the direction of peak flow. In the case of the river crossing, the two directions of flow are similar, with little tidality present. In such circumstances, the benefit of the additional width of 10m carriageway is unlikely to be achieved, nor would such a standard be appropriate. A two lane (or wide two lane) single carriageway road will thus not provide enough capacity in 2025 to provide sufficient relief to the existing bridge, based on our growth and mode shift assumptions.

6.17 The advice note gives the capacity of a dual carriageway with 7.3m (two lane) carriageways as 3600 vehicles per hour; no standard carriageway cross-section provides an intermediate level of capacity, thus a dual carriageway standard is the appropriate scale of provision. The provision of two lanes of each direction on a new bridge will provide a good level of service for users of the bridge, it will provide capacity which can be used on occasions when capacity of the existing bridge needs to be removed for maintenance purposes and it will allow a ‘busway’ level of service to be provided to buses, without the need to segregate them from general traffic. Additional benefits to buses can be incorporated into the layout of junctions at each end of the bridge to ensure that buses are provided with a higher level of service than that accorded to general traffic.
6.18 There may be an argument for adopting a dual carriageway standard for the new crossing, but restricting the nearside lanes for use as busway lanes, on the grounds that the traffic demand in the opening year will be less than in the design year, and that bus lanes would give public transport a psychological boost, and reduce general traffic growth in the longer term. However, there would be no (legal) scope for general traffic to overtake, and this might lead to driver frustration and illegal/unsafe manoeuvres by car drivers seeking to pass slow moving vehicles. Extreme congestion would occur if traffic diverted to the new crossing in the event of an accident or other incident on the Silver Jubilee Bridge.

6.19 We have thus concluded that the new crossing should be provided with two carriageways, each with two standard width lanes. Whilst the carriageway markings would differ if the nearside lanes were to include bus priority, the actual physical carriageway width would be the same as a standard dual carriageway. The route will also need to provide for cyclists and pedestrians. There are unlikely to be very large number of each and, given the high cost of bridge construction compared with an on-land highway, it is important that the overall width of the crossing is kept to a minimum, commensurate with meeting operational and safety requirements. We have thus assumed that pedestrians and cyclists would share a combined footway/cycleway of 3.5m width, and this would be separated from the main carriageway by a 2m strip which could include some form of guard-rail or barrier.

6.20 Urban road standards can be constructed in a slightly narrower width than rural standards. However, as the road will connect with relatively high speed roads on both banks – the Widnes Eastern By-pass built to 120kph rural standards north of Fiddlers Ferry Road, and the Runcorn Expressway built to a standard which falls well-short of rural grade separated road standard but, nevertheless including hard shoulders and no frontage access. We have concluded that the standards appropriate to a 40mph urban road would be lowest appropriate design standard to adopt for the new road – ie an 85kph A standard in TD9/93. In terms of cross-section, therefore, we have allowed for an overall bridge width of 27m (see Figure 6.3), which would be laid out as follows –

- Parapet/edge beam – 1.0m
- Footway/cycleway – 3.5m
- Footway/carriageway separation – 2m
- Carriageway – 7.3m kerbed
- Central reserve – 4.5m including lighting columns and crash barrier
- Carriageway – 7.3m kerbed
- Edge strip – 1.4m
- Parapet/edge beam – 1.0m
6.21 In order to satisfactorily accommodate the expected traffic flows in a safe manner, the minimum horizontal radius would generally be above 360m, and some widening of the bridge would be required on curved sections to ensure that the parapet or central reserve crash barrier does not limit forward visibility.

6.22 Whether or not lanes on the main bridge crossing are marked out as bus lanes, the approaches and exits from the terminal junctions would be marked as three lanes in each direction – a busway lane and two general traffic lanes, to provide bus priority and to ensure that the terminal junctions do not inhibit overall bridge capacity or create avoidable delays to bus services.
7. RIVER MERSEY AND RELATED ENVIRONMENTAL ISSUES

Introduction

7.1 This Chapter presents an overview of the key issues of estuary hydraulics, navigation and ecology that would be involved in crossing the upper estuary of the River Mersey and the associated factors likely to influence the design of the crossing.

7.2 To ensure that the overview is up to date and includes the present views of the various regulatory organisations, discussions have been held with:
  - Mersey Conservancy
  - The Environment Agency
  - The Manchester Ship Canal Company
  - The Mersey Docks and Harbour Company (formal response awaited)
  - English Nature

Estuary Hydraulics

7.3 With one of the largest tidal ranges in the UK, in excess of 10m at Liverpool, the estuary of the River Mersey is very highly dynamic. Although the “narrowing” at Runcorn Gap reduces the tidal range and influence, the upper estuary is particularly dynamic up to Cuerdley Marsh/Fiddlers Ferry.

7.4 This is demonstrated by the changing pattern of the low water channels, with realignment, deepening and accretion occurring over varying periods of time.

7.5 The channel at Runcorn is fixed by the narrowing of Runcorn Gap and by the wall of the Manchester Ship Canal. Upstream, however, the channel is highly dynamic and continually changing. The secondary channel at Spike Island/Widnes Warth, similarly is under continual change of deepening and accretion. Recent changes such as deepening at Widnes Warth and shallowing at Hempstones Point could increase the proportion of flow in this “secondary” channel. The Environment Agency has recorded that part of Runcorn Sands became colonised for a period of time by saltmarsh visible at low tide but then, over a relatively short period of a few months, the whole area disappeared through erosion.

7.6 Such changes are driven by variations in water levels and volumetric flow rates that arise from cyclical variations in tide levels, occasional storm surges from the Irish Sea and through seasonal and weather dependant changes in the fluvial flow. The resulting impacts of these variations is dependent on the morphology of the estuary at that time. It is, therefore, very difficult to predict the likely changes in morphology, with or without a new estuary crossing, other than in very broad terms.
7.7 However, small changes in water levels can affect the stability of large areas of saltmarsh and small variations in local velocities can affect the erosion and deposition patterns within a large area of the estuary. This could increase scour at existing structures and in other vulnerable areas and cause accretion in the navigable channels that would require an increase in maintenance dredging.

7.8 The volume of water contained in the estuary at high tide between low and high water levels helps to maintain the deep water channels through a flushing action on the ebb tide. Any significant loss of this inter-tidal volume, for example resulting from land reclamation within the tidal zone, could have adverse effects on the sedimentation patterns within the estuary.

7.9 In the late 1980s a scheme was proposed to reclaim parts of Runcorn Sands and Widnes Warth to create a large marine lake, Halton Water, for recreational boating and water sports. Advantage was taken of the physical model of the Mersey Estuary that then existed at Hydraulics Research, Wallingford to undertake some preliminary modelling to assess the likely impacts on the hydraulic regime of the estuary.

7.10 The results indicated that there would be no significant change in downstream water levels but that upstream water levels would be marginally lowered (this could have some adverse effects on saltmarsh areas). Also, a new low water channel would be likely to form and this could result in increased scour alongside the Ship Canal wall at Runcorn. It should be noted that sedimentation was not modelled but that only hydraulic modelling to determine impacts on water levels was undertaken.

7.11 Since the Halton Water project was proposed not only have flood defence standards been raised and the likely rise in mean sea levels through global warming been recognised but, also, other environmental, ecological and nature conservation issues have become more important.

7.12 It is likely that the Environment Agency and the Mersey Conservancy would object to the proposed crossing unless it could be satisfactorily demonstrated that there would be no significant adverse effects on the water levels and sedimentation patterns within the estuary.

7.13 This would require a comprehensive programme of hydraulic and sedimentation modelling. Computer modelling programmes currently available have limitations in complex dynamic estuaries and it is highly likely that physical modelling will be needed in addition. It should be recognised that, even after a comprehensive and expensive programme of modelling, the impacts may require extensive and complex mitigation.
Navigation

7.14 The River Mersey estuary is navigable up to Howley Weir in Warrington. Although some landing stages and riverside wharves are still in existence, the river above Runcorn is no longer used by commercial traffic. Present use is confined to pleasure craft visiting the yacht havens at either Widnes Lock or Fiddler's Ferry Lock or simply cruising in the estuary.

7.15 The shifting sandbanks and narrow, shallow channels at low water, make navigation very difficult at most tidal states. It was this difficulty and unreliability of the navigation in the upper estuary that led to the extension of the St Helens Canal from Warrington to Widnes in 1833 and was one of the contributory factors that led to the construction of the Manchester Ship Canal which was opened in 1894. It is the Ship Canal that now carries all commercial shipping above Runcorn.

7.16 Prior to the construction of the high level railway bridge at Runcorn Gap in the nineteenth century, there was no height restriction on vessels sailing above Runcorn. The railway bridge restricts the air draft of vessels to about 23.5m above the level of Mean High Water Spring tides in the river and about 24.2m above the normal water level in the Ship Canal.

7.17 Upstream of the alignments under consideration, the river is crossed by a National Grid power line at Cuerdley and by Forest Way Bridge at Arpley. The latter restricts air draft to 10m over a 40m wide navigation channel.

7.18 The Ship Canal is crossed by both fixed and opening bridges. The fixed bridges are at high level with an air draft clearance of about 22m or more above normal canal water levels and they present no obstruction to the vessels using the canal. The opening bridges are generally swing bridges at quay level with air draft clearance when closed to shipping of 5 to 6m.

7.19 Commercial shipping to Manchester and Salford has declined substantially over the last 20 years. Present levels of shipping traffic above Runcorn requires the swing bridges to be operated on average 3 No. times per day with a peak operation level of about 8 No. times per day. Shipping movements can be at any time of the day or night and, as ships have priority over road traffic, the Ship Canal Company has the right to operate the bridges at any time. Delays to road traffic through swinging the bridges can be up to 13 minutes but, typically, are 8 to 10 minutes.

7.20 The current pattern of shipping is, of course, no guarantee of likely future patterns.
7.21 The St Helens Canal was constructed to carry sailing barges and all the original bridges had opening spans. Although abandoned in 1963, it is the policy of Halton Borough Council in conjunction with Warrington Borough Council and St Helens MBC to restore the St Helens Canal to through navigation from Widnes Lock to St Helens town centre. Currently, marina/yacht haven facilities are operated by Halton at Widnes and by Warrington at Fiddlers Ferry, both with direct lock access to the estuary. When certain physical blockages on the canal are removed it is proposed to dredge the canal to allow vessels the option of navigating between Widnes and Fiddlers Ferry via either canal or estuary. This flexibility will be of great benefit to vessels sailing in the tidal estuary.

7.22 It is possible that vessels with masts up to 20m may wish to use the canal but, in practical terms most vessels will be smaller than this. Nevertheless, even a small family cruiser will have a mast height of at least 6m above waterline.

**Ecology and Nature Conservation**

7.23 The options being considered all cross to the east of the existing Runcorn Bridge. Although there are no statutory designated sites that are crossed by these routes, a number of non-statutory sites could be directly affected. The following non-statutory Sites of Biological Interest (SBIs) are located in the vicinity:

- The Manchester Ship Canal Bank at Astmoor is Grade B (District Interest) SBI;
- Astmoor Saltmarsh is a Grade C (Local interest) SBI;
- Fiddlers Ferry salt marsh is a Grade B (District Level) SBI;
- St Helens Canal is a Grade C (Local interest) SBI;
- Widnes Warth marshes are also due to be designated as non-statutory SBIs.

7.24 The crossing options being considered all take a proportion of these SBI marshes. Although these sites are not protected by statute, they are by structure and local planning policies. The ecological consequences of constructing a bridge in this location are at this stage difficult to predict in any detail, however, during the construction stage it is likely that very large adverse impacts will occur wherever the crossing is constructed. The possible impacts are discussed in further detail in Chapter 13.

7.25 The Mersey Estuary was re-notified as a Site of Special Scientific Interest (SSSI) in 1985 under the 1981 Wildlife and Countryside Act and this extends up to the existing Runcorn Bridge. The site also qualifies (under article 4.2 of the EC Birds Directive) as a wetland of international importance (RAMSAR site) in that it regularly supports over 20,000 waterfowl in winter. It is also a proposed Special Protection Area (SPA) comprising a range of international and national important habitats.
7.26 In the UK, estuaries and associated mudflats and saltmarshes form dynamic communities rich in marine fauna. These provide vital feeding grounds for migrating birds and are therefore of high conservation importance. There have been substantial losses and alterations to estuarine habitats in the past owing to human activities, in particular from land claim and development of the coastal fringes, which can have knock-on effects such as pollution. In response to these pressures, many of the UK’s estuaries have been designated as SSSIs and SPAs under the EC Birds Directive. Many remaining sites hold the local designation of SBI (Site of Biological Importance). These habitats have also been recognised as priority habitats in the Biodiversity Action Plan in which a statement details the current status, action and conservation direction. This states that that existing estuarine habitats should be managed within the framework of SACs thus safeguarding their integrity as habitats and where possible these should be enhanced or replaced.

Ground Contamination Issues

7.27 The provision of a new crossing of the Mersey will have implications in relation to construction on contaminated land.

7.28 The land immediately south of the River Mersey, at Wigg Island, was investigated by WS Atkins as part of a commission from the Commission for the New towns. This area is extensively tipped with material, believed mainly to have originated from demolition and clearance of factory sites in the Runcorn area. Significant depths of fill material (up to 12m) were encountered on the island, particularly in its central area. In addition, ground contamination is thought to have arisen from a Mustard Gas factory which was formerly on the island. Contaminants found to be present include heavy metals and metalloids and phenol. Contaminated fill materials may also be present on the mainland to the south of the Manchester Ship Canal as a result of previously contaminating industrial land use.

7.29 On the northern bank of the Mersey, the area in the vicinity of Spike Island was the centre of the formation of the chemical industry in the Widnes area and as a result, carries a legacy of severe ground contamination. Although some remedial works have since been carried out, there is a high potential for significant ground contamination in this area, particularly resulting from Le Blanc waste (an alkaline waste of high sulphur content, often contaminated with heavy metals), which was a by-product of the soap making industry. A range of other contaminants may be expected to be encountered.

7.30 The presence of ground contamination may have the following impacts on construction.

- Health and safety implications for construction workers.
- Effect on durability of construction materials, for example higher concrete class and special design measures may be required in piles.
- Arisings from construction works (piling) and earthworks may be significantly contaminated and require a specialist disposal route.
7.31 In addition, piling in this area needs to be considered in the context of environmental impact due to the presence of a regionally important aquifer. Piling has the potential to create a preferential pathway for downward migration of contaminants through the glacial clay, which is known to be at least superficially present in this area. The clay forms a relatively impermeable barrier to downward migration of contaminants at the surface and as such normally protects the underlying aquifer. Advanced piling design and construction techniques would be required in order to mitigate this risk.

7.32 The exact nature of contamination present at the proposed bridge alignment locations will require definition by specialist ground investigation in the areas proposed. In addition, ground investigation will also be required to define geotechnical conditions and rock head levels at the proposed alignment locations, so that piling depths can be established.

7.33 It is therefore recommended that a combined geotechnical and environmental ground investigation is undertaken at each proposed location so that the cost implications of physical ground conditions and the presence of ground contamination at each location are fully appreciated during the decision making process.
8. BRIDGE ENGINEERING AND DESIGN ISSUES

INFLUENCES ON BRIDGE ALIGNMENT AND LOCATION

Horizontal Alignment

8.1 It will be clear from the description of ecological and hydrological issues set out in Chapter 7 that to minimise the impacts that the crossing would have on the river and, hence, also minimise the influence of the river on the design and construction of the crossing, it may be appropriate to select an alignment which minimises the length of the crossing over the estuary.

8.2 A narrow crossing point (such as Runcorn Gap or Cuerdley Marsh) has the advantages that the river channel is more likely to be "fixed" in alignment and, hence, the impacts of the navigation span on the low flow channel would be minimised and also the length of crossing over tidal water and the associated construction risks also would be minimised.

Vertical Alignment

8.3 The vertical alignment will be influenced by the current and future navigation provision over the waterways, as well as highway design requirements, and the level of the existing roads at the tie in points.

Manchester Ship Canal

8.4 Air draft for vessels is presently restricted by fixed bridges at:-

<table>
<thead>
<tr>
<th>Location</th>
<th>Draft (m)</th>
<th>Water Depth (m)</th>
<th>Air Draft (m)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Runcorn, railway bridge</td>
<td>28.63</td>
<td>4.38</td>
<td>24.25</td>
</tr>
<tr>
<td>Runcorn, road bridge</td>
<td>28.84</td>
<td>4.38</td>
<td>24.46</td>
</tr>
<tr>
<td>Latchford, high level road</td>
<td>26.34</td>
<td>4.38</td>
<td>21.96</td>
</tr>
</tbody>
</table>

8.5 To allow free passage of all vessels that can presently pass under Runcorn railway bridge, the proposed crossing should have a minimum soffit level of 28.63mOD, providing an air draft of 24.25m above normal canal water level.

River Mersey

8.6 Similarly, the Runcorn railway bridge is the limiting constraint for vessels on the River Mersey and the navigation span over the main deep water channel should have a minimum soffit level of 28.63mOD, if existing navigation rights are to be maintained. This will provide an air draft of about 23.5m above the level of Mean high water spring tides (MHWS) - approximately 5.10mOD.
For other spans a minimum air draft of about 6m should be provided above MHWS to allow the movement of small vessels; this will require a minimum soffit level of 11.10mOD.

The high ground on the Runcorn side of the river makes it relatively easy to construct a high level crossing over the Ship Canal and to continue at high level across the main channel of the river, where this is close to the right bank.

As an alternative to a high level crossing over both waterways it would be possible to consider a low level crossing with opening spans that provides a minimum air draft of 6m when closed to shipping. Opening bridges have a high capital cost and incur high costs in operation and maintenance. This option would only be justified if substantial cost savings could be achieved over the fixed bridge option and if the potential disruption to road traffic would be acceptable.

The Manchester Ship Canal Company would probably agree to take on responsibility for the operation and maintenance of an opening bridge over the ship canal under a reimbursement contract. However, there is no doubt that the company would prefer the high level, fixed bridge option.

There would be more difficulty in finding an operator for an opening bridge over the navigation channel in the river. The Mersey Docks and Harbour Company is the navigation authority for the whole of the tidal estuary. It is unlikely that the company would wish to take on the role of bridge operator but, again, is likely to prefer a high level, fixed bridge option.

There is a possibility of utilising opening bridges set at an intermediate level with the object of reducing the frequency of bridge operations and hence, also, reducing the disruption to road traffic, as compared with a low level opening bridge, although at greater capital cost. Unless the savings gained through reduced traffic disruption are substantial, this option is unlikely to be cost beneficial. In addition, there is a potential safety hazard involved in introducing a new bridge on the Ship Canal at a level significantly different from the others. For this reason alone, the option is unlikely to be acceptable to the Ship Canal Company.

To maximise the potential of the section of canal between Widnes and Fiddlers Ferry after full restoration, it would be preferable for there to be no additional restriction on air draft other than that imposed by the existing bridges over the Mersey at Runcorn. However, this would be expensive to achieve and is most unlikely to be justifiable in any cost-benefit analysis, or on the basis of likely utilisation.
8.14 There may be some merit in considering an air draft of 10m to be consistent with the bridge at Arpley and the upper Weaver Navigation. However, for the purposes of this study, we have assumed that the canal could be bridged with a minimum clear span width of 7m and an air draft of 3.5m above normal canal level. This would allow the passage of powered craft, (and horse and rider on the towpath) and require a minimum soffit level of 10.15mOD.

**Pier Locations and Numbers**

8.15 To minimise any reduction in the inter-tidal volume and any impacts on the hydraulic regime of the estuary, the crossing should be as “permeable” as possible. This can be achieved by maximising the clear spans of the bridge deck thereby minimising the number of piers required within the river.

8.16 It is likely that, within the estuary, bedrock or other stratum suitable for the founding of bridge piers will be at some considerable depth, thus making the piers very expensive to construct. This is another reason for minimising the number of piers but as this increases the deck span widths and costs, there will be an economic design balance to be achieved.

8.17 Minimising the number of piers has environmental benefits in minimising the direct impacts on the sandbanks and saltmarshes within the estuary. Also, as the estuarine sediments are known to contain historical contamination arising since the industrial revolution, minimising the number of piers reduces the potential for pollution of the estuary during construction.

8.18 The possible use of embankments to cross the saltmarsh areas at Widnes Warth and Astmoor are likely to receive objections from both the Mersey Conservancy because of potential impacts on the hydraulic regime and from the Environment Agency because of the direct loss of saltmarsh habitat. It is suggested that consideration of this option would not be appropriate at this stage but should be deferred to a subsequent stage of design development.

8.19 It is likely that the Mersey Conservancy and the Mersey Docks and Harbour Company will express strong preference for the deep water channels within the estuary to be allowed to move as part of the natural dynamic processes. It is likely that objections would be made to any “hard” engineering works within the estuary designed to restrain the channels through particular spans. However, as the foundations for piers will need to be deep, it may be possible to consider several or even each span to be a navigation span by allowing scour to occur at the piers. The alternative could be to resort to maintenance dredging to allow high-masted vessels passage through the bridge.

**ENGINEERING OPTIONS FOR FORM OF CROSSING**

8.20 In this section of the report we consider the engineering options for the type of bridge, bearing in mind the influences set out in the preceding paragraphs.
8.21 Mott MacDonald Consultants Ltd were previously appointed by Halton Borough Council to consider specific aspects of a river crossing that would provide localised integrated transport benefits. They were asked to look at the potential form of construction of the crossing and the order of magnitude of costs.

8.22 The report produced by Mott MacDonald considered crossings 750m and 1000m in length, together with reclamation of the north shore, assuming that this would take place. The cost of the structures and road works required to tie-in with the existing road networks to the north and south, and the land purchase that would be required to achieve this, were not considered in detail.

8.23 The overall length of eastern crossings being investigated by the present study, between the Bridgewater Expressway and the Widnes Eastern Bypass, would vary between 2100m and 2800m, with the river crossing itself measuring up to approximately 1000m.

8.24 The most economic form of construction concluded by Mott MacDonald comprises precast concrete segmental deck units constructed to form a viaduct with 100m spans. This conclusion is concurred with by the present study, however it is subject to demonstration of suitable ground conditions at an acceptable level for foundations.

8.25 Long span crossing options such as cable stayed and suspension bridges could minimise the number of piers in the river and therefore minimise the impact of the crossing on the marine environment. For the crossing lengths under consideration in this study, a suspension bridge would historically have been the most economic form of long span construction. The tower heights for a 1000m main span would be in the region of 100m high above deck level, equivalent to approximately 140m OD. This is below (that is, it does not interfere with) the obstruction height surface for Liverpool Airport of approximately 170m OD. With the ongoing advances in design and construction, a 1000m main span can now be achieved using a cable-stayed bridge. However, the tower height associated with this form of construction would be significantly higher than that required for a suspension bridge and far in excess of the maximum permitted obstruction height for Liverpool Airport (and is therefore not feasible).

8.26 The overall construction costs for a long span crossing option would be considerably in excess of those for a viaduct with 100m spans. The costs can be summarised as approximately £3000-£4000/m² deck area for a suspension bridge, £2500/m² deck area for a cable stayed bridge and £1000/m² deck area for a multiple span viaduct. (That is, a 27m wide, 1km long suspension main span, with short back-spans, would be at least £80m more expensive than a multiple span crossing).

8.27 Long span crossing options would generally have to follow a straight line, therefore consideration would have to be given to the positioning of the towers in order to accommodate the back spans associated with each form of construction.
8.28 Whilst the bridge deck for each of the possible crossing options could be formed from either concrete or steel box girders, there would be considerable additional maintenance costs associated with the use of steel in this marine environment.

8.29 The requirement for navigational clearance over the Manchester Ship Canal dictates the level of a fixed crossing on the south bank. For a multiple span viaduct, the structure level could reduce gradually to the north of the ship canal and result in a relatively unobtrusive low level crossing of the River Mersey. If a long span structure option were to be implemented, then the deck height would be fixed at relatively high level for the entire crossing. Such a structure would become a significant landmark feature in this area.

8.30 A low level crossing could also be implemented in conjunction with a moveable bridge (£5000/m² deck area) over the Manchester Ship Canal. However, the road links with the Bridgewater Expressway to the south require the levels to be raised to a height comparable with a high level crossing of the Ship Canal. Therefore, construction of a more expensive moveable structure, together with the increased operational and maintenance costs that would be associated with it, is not considered to be an appropriate solution in this instance.

8.31 At the present time, there is very little information available with respect to the ground conditions in the region of the proposed crossing. The level of rock is not known with any certainty, therefore the depth to which foundations for the crossing would have to be sunk could be considerable and this might have significant implications for the scheme as a whole. Whilst a long span solution would reduce the number of foundations required, the loads imposed at each support would be considerably greater than for the multiple span option and would therefore require significant ground improvement measures at each location.

8.32 The ground conditions could be the dominant factor in choosing a preferred alignment for the crossing and will need to be investigated further (as described in Chapter 19).

8.33 The economic and financial assessment described in Chapter 14 led us to conclude that the additional cost of the suspension span would put the overall cost of the project beyond economic and financial viability, notwithstanding the potential reduced ecological, hydrological, and navigation impacts. The schemes described in detail later in the report are thus based on the assumption that the bridge would take the form of a multi-span concrete box girder of approximately 100m spans; full navigation clearance would be provided over the Manchester Ship Canal using a fixed span; only a 6m clearance would be provided over the river (though clearly a greater height would be available under spans close to the Ship Canal) with general navigation rights extinguished; and a 3.5m clearance would be provided over the St Helens Canal. (The provisional vertical alignment is shown in a long section in Figure 8.1).
9. AIR QUALITY AND NOISE POLLUTION ISSUES

Introduction

9.1 The 'West Bank' area on the north bank of the river, and the Runcorn Town area on the south bank were developed largely in the late 19th/early 20th centuries. The current bridge and its approaches are located immediately adjacent to these settlements, with the approach roads generally at roof height. Though high solid barriers have been erected on the east side of the approaches north and south of the bridge, there are serious concerns regarding air pollution and noise, emanating from traffic on the bridge, affecting West Bank and Runcorn Town.

9.2 The provision of a new crossing well to the east of the present crossing, transferring a significant proportion (25% to 30%) of bridge crossing traffic away from the current crossing point to a new crossing will have an impact on roads other than just the bridges. However, the nature of the road network on both banks is such that the main routes are modern and do not abut directly with any significant numbers of residential properties. For this reason, our assessment of the noise and air quality issues addresses only the West Bank and Runcorn Town areas.

9.3 Information on the current noise and air quality situation was derived by selecting five addresses located within 200m of the existing bridge and approaches to be representative of the area as a whole (as indicated in Table 9.1).

Existing Environmental Conditions

9.4 Estimates of the current environmental noise and air quality have been obtained using the assessment methods described later. This provides a baseline for establishing future trends.

Noise

9.5 The predicted existing 18-hour noise levels at the positions considered are given in Table 9.1.

9.6 Although some properties are within 40 metres of the busy A533 they are exposed to reduced noise levels. This is mainly due to the noise barriers along the eastern side of the existing road bridge and the screening effect of the elevated structure. The upper storey of West Bank Primary School, position A is not fully screened and as a result has very high noise levels.

Air Quality

9.7 The localised air quality for the current situation (1999) is summarised in Table 9.2.
9.8 Whilst carbon monoxide, benzene and 1,3 butadiene concentrations are less than their respective air quality objectives, nitrogen dioxide and PM10 concentrations are currently in excess. This indicates that most of the West Bank and parts of Runcorn near the existing bridge suffer from poor air quality.
SECTION C – DEVELOPMENT AND APPRAISAL OF SCHEMES

10. IDENTIFICATION OF POTENTIAL SCHEMES

Introduction

10.1 The previous chapters of this report have dealt in detail with the various policy contexts within which a new bridge would be built, and the various issues and physical constraints which must influence the choice of bridge location. Armed with this background information, we set out to identify potential bridge crossing locations which would be technically feasible and meet the general requirements of the policy context. This was done by reference to detailed mapping, and also through extensive site visits on foot.

10.2 In identifying what might be crossing locations which would warrant more detailed consideration, we bore in mind these following physical considerations.

Landing Points

10.3 The schemes would need to connect to the existing highway network at locations which would allow new junctions to be provided (or existing junctions to be modified, without compromising the safe operation of the existing highway network).

Impact on Property

10.4 In order to minimise adverse impacts on the economy, on regeneration issues, residential amenity and overall scheme cost, scheme alignments selected should ideally have minimal direct or indirect impact on active businesses, existing communities, and potential development sites.

Highway Standards and General Traffic Considerations

10.5 Our earlier analysis has shown that the scheme will need to provide a cross-section of the order of 27m in width, and be able to provide a horizontal and vertical alignment consistent with safe operation and a 40mph speed limit.

Public Transport Considerations

10.6 In order to provide a positive impact on bus modal share, the scheme options will need to incorporate measures to provide bus priority through the terminal junctions, and ‘busway level’ priority linkages to Widnes Town centre on the north bank, and Halton Lea on the south bank.
**Pedestrian and Cycling Considerations**

10.7 In addition to the pedestrian and cycle facilities inherent in the cross-section described previously for the crossing itself, scheme options will need to provide quality linkages to leisure and non-leisure destinations on both sides of the river.

**Schemes for assessment**

10.8 Our investigations identified two, or possibly three, landing points on the north bank of the river, and two possible landing points on the south side (see Figure 10.1).

10.9 On the Runcorn side of the river, the pattern of development and the layout of the existing expressway system led us to identify potential tie-in locations at the existing Astmoor West interchange on the Bridgewater Expressway, and at the current intersection between the Bridgewater, Daresbury, and Central Expressways. The scale of development to the west of the Astmoor West junction is too great, and the spacing of junctions on the expressway too close for a practical tie-in point to be located on this section. To the east of the Astmoor West junction there is a greater concentration of development than at the junction, and that junction's separation from the Central Expressway junction is far too small for an additional junction to be inserted.

10.10 A significant amount of industrial development is located immediately north of the Central Expressway junction. Nevertheless, principally because the majority of traffic bound for a new crossing can be expected to approach via the Central Expressway, we have identified this location as a potential tie-in point.

10.11 In order to minimise impact on property, a third tie-in point further to the east would have to be located some distance to the east, making the crossing relatively unattractive to the main traffic flows, and we have thus not considered locations further east than the Central Expressway.

10.12 On the north bank of the river there are fewer properties lying between the main road network (the Widnes Eastern By-pass) and the river bank, on the relatively short section where the Eastern By-pass is reasonably close to the Bank. The Albright and Wilson chemical works is the dominant structure on this section of the river, and we have identified locations immediately west and east of the plant as potential tie-in locations.

10.13 Immediately west of the plant there is a natural 'gap' where the public open space extends north from Spike Island to reach the By-pass. Alignments further to the west would affect the Spike Island area itself and also the development potential of the former ICI site now owned by St Modwen. The 'west of Albright and Wilson' alignment would tie in to the Eastern By-pass immediately south of the Garston-Warrington railway, requiring the introduction of a new junction at that point.
10.14 Similarly, a route with minimal impact on existing development is available immediately east of the Albright and Wilson plant. The alignment would connect with the Eastern By-pass between the existing Ashley Way and Fiddlers Ferry Road junctions.

10.15 Initially we also looked further east and gave some preliminary consideration to an alignment which would tie the scheme into the Tan House Lane corridor. However, our initial assessment of that route indicated serious difficulties in accommodating a suitable alignment, given the various railway crossings in the area and the need to avoid widespread impact on existing development.

10.16 Overall, therefore, we have identified two suitable tie-in locations on the Runcorn side of the river, an two on the Widnes side. Leaving aside sub-options which vary in the detail of the terminal junctions and alignment, these two-in points can be combined in four basic pairings (Astmoor West to West of Albright and Wilson, Astmoor West to East of Albright and Wilson, Central Expressway to West of Albright and Wilson, and Central Expressway to East of Albright and Wilson), and our main scheme options are built around these combinations (see Figures 10.2 and 10.3 for two examples).

10.17 In addition, however, there may be a need to carry out some alterations to the Silver Jubilee bridge approaches to complement a new eastern crossing. Indeed, there may be a case for some alterations to these approaches in any event (the 'Do Minimum' scenario). In the following paragraphs we set out in more detail the schemes we have taken forward to the assessment stage.

**Scheme 0 – the Do Minimum (See Figure 10.4)**

10.18 This is the base scenario against which the various possible new crossing options are compared.

10.19 In addition to various changes within Runcorn and Widnes town centres which are expected to take place in any event (associated with the Runcorn on the Mersey SRB proposals and retail proposals and the Peel House Lane link in Widnes), the Scheme 0 network assumes that action will be taken to maximise capacity on the Silver Jubilee Bridge on the Weston Point-Queensway axis, and limit capacity on the Bridgewater-Queensway axis, so as to minimise the constraint on sub-regional traffic and discourage use of the Bridgewater Expressway.

10.20 The changes are assumed to take the form of:

* relocating the east-west through link within the Bridge trumpet junction – both directions of flow would make use of the present eastbound (northern) carriageway which would be converted into a two-way single carriageway, so that traffic leaving the Bridge towards Weston Point can do so in two lanes. (The exit for Runcorn Station and the hotel would thus become a simple diverge, rather than a lane drop).
provision of a bridge to allow the minor Bridgewater to Weston Point traffic to merge on the nearside of the major Queensway to Weston Point traffic. This 'cross-over' bridge would be located west of the railway bridges, and the merge would occur in the vicinity of the bridge over Runcorn Docks Road; the merge taper would be extended to meet the diverge taper to Picow Farm Road junction.

- widening of the last section of the north-eastbound carriageway of the Weston Point expressway commencing near the bridge over Runcorn Docks Road, to form a three lane carriageway – two nearside lanes for Queensway, one offside lane for Bridgewater, and remarking of carriageways to allow two lanes of traffic to join Queensway from Weston Point; the northbound merge at Queensway being signal controlled to bias the available capacity in favour of the Weston Point approach.

- Subject to a connection being provided through a development site, linking the Greenway Road/Okell Street junction with the new traffic signals on the Bridgewater expressway, access to Runcorn Station could be improved as follows:
  - Closure of the Greenway Road link onto Queensway, and use of the top of the slip road and the cutting slope to provide a direct two-way connection from Greenway Road to Shaw Street, the residential section of Shaw Street being severed. The new link, in conjunction with the link to Okell Street described above providing access to the station from the Bridgewater expressway and Higher Runcorn.
  - Realignment of the Station Road/Picow Farm Road junction to provide priority for station traffic from the Station Road roundabout improving access from Widnes.
  - Provision of a direct exit from the north end of the northern car park onto Queensway providing an improved route back to Widnes (this latter feature may be more applicable to schemes which include a new easterly crossing of the River, as the Bridgewater – Queensway link will be carrying a much reduced traffic flow in that situation).

**Scheme 1 – Astmoor to West of Albright and Wilson (no new turns at Ashley Way)**

10.21 Provision of a new bridge and approaches linking the Bridgewater Expressway at the Astmoor West interchange with the Widnes Eastern By-pass west of Albright and Wilson and south of the Garston-Warrington railway line. The new route would connect into the Bridgewater expressway at the current expressway level with a roundabout junction, and would almost certainly require the demolition of one multiple-unit property (see Figure 10.5). The connection with the eastern bypass could be either signal controlled, or takes the form of a roundabout (see Figure 10.6). Access to the reclamation land on the Widnes Bank would take the form of an all-moves junction on the main line of the new route, just south of the St Helens canal, or a left in/left out junction on each carriageway, with a link under the new route adjacent to the St Helens Canal.
10.22 The scheme would include bus priority measures, effectively linking Widnes into
the busway system, including – potentially, a continuous bus lane on each
carriageway of the new route; additional lanes for buses within the configuration
of the revised Astmoor interchange; a northbound bus lane to partially by-pass the
Fidlers Ferry Road junction (movement from Eastern By-pass towards Lugsdale
Road), and some southbound alterations to provide bus assistance from Lugsdale
Road onto the by-pass; a new at-grade link between the busway and Castlefields
Avenue East – see Figure 10.7 - (with amendments – the introduction of traffic
signals - to the Daresbury Expressway/Astmoor Spine Road/Castlefields Avenue
junction to assist the west to south right turn).

10.23 It may also be possible to provide a new link in the busway network from the New
Bridge/Widnes Eastern By-pass junction along the southern boundary of the
Eastern By-pass to connect with Waterloo Road.

10.24 Cycle and pedestrian facilities would include a combined facility on one side of
the new route with ramped (and possibly stepped) connections to –
- The Alforde Street underpass (Widnes Eastern By-pass)
- The eastern footway on Widnes Eastern By-pass
- The St Helens Canal towpath (Trans Pennine Trail)
- The Special Development Opportunity at Widnes Warth
- Wigg Island (for Wigg Island and links to the town centre via the swing
  bridge)
- Astmoor Road/Busway for access to local premises and the bus services
- Via the lower level of Astmoor West interchange to the Bridgewater Canal
towpath

10.25 General traffic provision would include at least one lane in each direction on the
main part of the crossing (the second lane on each carriageway could either form a
continuous bus lane, or a second general traffic lane, as is considered most
advantageous at various times in the future), with widening at the junctions.
Additional traffic lanes would be provided on the approaches to and exits from the
terminal junctions. The scheme would also include the changes at the Queensway
junction on the south bank as described in the Do Minimum scenario.

10.26 Given the reduced flows on the southern section of the eastern by-pass in this
scenario, it may be possible to provide a route for northbound buses into West
Bank (U turning from the northbound carriageway onto the southbound
carriageway, and then turning left into Waterloo Road). Consideration could also
be given to lowering the eastern by-pass to cross Hutchinson Street at grade –
providing a direct link between the West Bank Dock area and M62 at Junction 7,
though these latter elements have not been given specific consideration in this
study.
Scheme 2 – Astmoor to West of Albright and Wilson (with south to west and west to south turns at Ashley Way)

10.27 As scheme 1 but with alterations to Ashley Way/Eastern By-pass to provide for south to west and west to south turning movements. These facilities would be used by a moderate flow in normal circumstances, but would allow for diversion of larger flows of traffic during incidents which lead to the full or partial closure of the Silver Jubilee Bridge.

10.28 Sufficient topographic information is not currently available to determine the feasibility or the extent of level changes required to incorporate both turning movements into the current Ashley Way/Eastern By-pass junction. Our scheme thus assumes that the south to west left turn is accommodated within the junction, but the west to south right turn has been provided for by providing a northbound U-turn on the eastern by-pass, immediately south of the Bowers Business Park southbound to northbound U-turn (as shown in Figure 10.6).

Scheme 3 – Astmoor to East of Albright and Wilson

10.29 As scheme 1, but with northern termination on the Eastern By-pass east of Albright and Wilson and north of the Garston to Warrington railway line. The termination on the eastern by-pass would probably take the form of a roundabout though signal control might be possible (see Figure 10.8). The scheme would provide improved access into the Tan House Lane and Gorsey Lane industrial areas by providing a new link from the new roundabout, following a line adjacent to the northern side of the Garston-Warrington railway line to link via Cornubia Road into Tan House Lane. This link would also provide the exit from the Earle Road/Dennis Road area, allowing two of the four sets of signals at the Fiddlers Ferry Road junction to be removed (Earle Road would remain open southbound).

10.30 Access to the reclamation land would be made via an independent link, connecting to the eastern by-pass west of Albright and Wilson – a second point of access, connecting to the new bridge approach immediately south of the St Helens Canal may also be possible.

10.31 Pedestrian/cycle links would continue to be required at all locations previously identified, together with links to the link to Tan House Lane.

Scheme 4 – Central Expressway to West of Albright and Wilson (with new turns at Ashley Way junction)

10.32 The north bank provisions would be the same as Scheme 2.

10.33 On the south Bank the new link would connect to the Central/Bridgewater/Daresbury expressway junction, by forming (probably) a conventional roundabout at the current upper level of the interchange (see Figure 10.9). It is likely that the existing bridges over the Bridgewater/Daresbury expressway and Bridgewater canal would need to be replaced so as to provide adequate carriageway width.
10.34 Bus facilities would be similar to Scheme 1 except that on the south bank, these
would take the form of lanes to assist at least the north to east and east to north
turns at the Central Expressway junction (and include the works on
Expressway/Astmoor Spine Road junction and Castlefields Avenue East).

10.35 Pedestrian and cycle facilities would again be similar to those for Scheme 1 (but
located further east, on the south bank, but again giving access to Wigg Island,
Astmoor Road/busway, and the Bridgewater canal towpath. Access to the
Bridgewater canal towpath and locations further south would make use of existing
subways beneath the expressway.

10.36 The central expressway junction and approach will require the demolition of a
number of properties.

Scheme 5 – Central Expressway to East of Albright and Wilson

10.37 This option combines the southern section of Scheme 4 with the northern section
of scheme 3.

Scheme 5A – Central Expressway to East of Albright and Wilson (plus grade
separation)

10.38 This scheme would be similar to scheme 5, but it would include flyovers to take
traffic from the new crossing over the Fiddlers Ferry Road junction to tie in to the
Eastern By-pass north of that junction. This would reduce delays at the north end
and reduce the need to modify the Fiddlers Ferry Road junction.

10.39 At the south end, a third level flyover would be provided to link the new crossing
directly to the central expressway. (A conventional roundabout would be used at
the intermediate level to connect slip roads from the lower and upper levels). The
circulatory flows at his roundabout would be low, possibly allowing retention of
the existing bridges. The schemes would include the same public transport and
walking/cycling facilities as outlined for Option 5.
Scheme 6 - Duplication of the existing bridge (see Figure 10.10)

10.40 The previous study which investigated the provision of additional crossing capacity across the Mersey concluded that the optimum option was to locate a new crossing immediately adjacent to the Silver Jubilee Bridge (that is, between the Silver Jubilee and Railway bridges). Because of this, we have considered it prudent to carry out some analysis of this type of option in order to provide a complete picture. This scheme option, included therefore because of its historic context and previous studies, consists of providing a new bridge immediately west of the existing bridge. The bridge would consist of four (northbound) lanes, allowing two lanes of traffic to enter from Weston Point, and a bus lane and a general traffic lane from the Bridgewater Expressway. The traffic would need to weave on the bridge, to select the correct exit lane. The four lanes on the bridge would feed the start of the Widnes Eastern By-pass (either 1 lane, or 1 bus lane and 1 general traffic lane) and the main exit towards Ditton Road roundabout and Liverpool (either 3 lanes or two lanes). The new bridge would make use of the 'stub' which was built for a second bridge on the Runcorn Bank and tie back into the existing road on the north bank at the nose of the Widnes eastern By-pass exit. The existing bridge would become southbound only, the four lanes being formed from the bus lane approach (1 lane), the Widnes Eastern By-pass approach (1 lane), and two lanes from Liverpool/Ditton Rd roundabout. At the south end of the bridge, two lanes would link to the Bridgewater Expressway exit, and two lanes towards Weston Point.

10.41 Elsewhere in the report, this option is referred to as duplication of the existing bridge. However, it should NOT be inferred that a second bridge at this location would take the form of a steel arch – the number of traffic lanes available would be duplicated, but a much simpler and less visible form of construction is envisaged so as to minimise costs and to avoid detracting visually from the current road and rail bridges.

10.42 The scheme would include the changes to the Queensway trumpet outlined in the Do Minimum scheme (but excluding the traffic signals which would not be required).

10.43 This scheme would not include any significant upgrading to bus facilities, but would carry a new pedestrian/cycle way on its west side, connecting to ground level near Egerton Street on the Runcorn bank, and to the existing (extended) pedestrian subway opposite Irwell Street on the north bank. Additional ramps may also be possible to connect with ground level closer to the river on both banks.
11. TRAFFIC MODELLING

Introduction

11.1 In order to assess the impact on traffic flows, congestion, and delays which the introduction of an additional crossing of the river might bring about, we have built a SATURN traffic assignment model of the Halton area.

11.2 The model allows us to assess traffic flows, junction turning movements, levels of delay and congestion on elements of the road network, and for the network as a whole for a number of possible future scenarios, including a ‘Do Minimum’ scenario of not providing additional river crossing capacity.

11.3 The model consists of two basic parts – a representation of the road network as a series of nodes (junctions) and links (roads), and a representation of the traffic using the system in the form of a series of trip matrices.

11.4 The model’s geographic extent covers the area from A5300 Knowsley Expressway in the north west to the Dans Road roundabout on A562 in the north east; from M62 in the north, to M56 in the south; and from Weston Point in the south west, to the A56/A558 roundabout in the south east. It includes most roads of significance within the area, particularly those likely to be used by traffic which crosses the River Mersey. Within the Runcorn Town area, the Widnes Town centre area, and the Tan House Lane area the network has been coded to include a detailed representation of each junction. This type of coding has also been used for the existing Silver Jubilee bridge and its approaches, for the Widnes Eastern By-pass south of Fiddlers Ferry Road, and for the Weston Point and Bridgewater Expressways from west of the Queensway slip roads to the junction with the Central Expressway.

11.5 This type of coding ensures a more accurate analysis of junction performance and delay for the area of the network which would be most affected by the provision of alternative bridge crossings. Outside of the area described above, ‘buffer’ type coding has been used in which vehicle speeds are assumed to vary with traffic flow level on links, and delays at individual junction are not assessed at detailed level.

11.6 The network coding takes account of the standard, width, and speed of traffic on each route. Each junction within the ‘simulation’ area includes details of which lanes are used for which traffic movement, the method of control, and traffic signal timings (where appropriate). A plot of the network is shown in Figure 11.1.

11.7 In order to produce trip matrices of traffic movements in the area a zoning system is required. Trips originating in various areas are grouped together to form zones. Trips from a zone are assumed to follow a similar routing irrespective of where within the zone the trip actually originates. The zoning system has thus been devised such that areas which may use different routings to a river crossing point are zoned separately.
11.8 The zoning system consists of 15 zones in Halton on the south bank of the river, and 11 on the north bank. Locations outside Halton have been grouped into a further 26 zones based on their likely point of entry to the modelled area. For ease of reference each zone has also been given a name as well as a number. The zoning system is shown in Figures 11.2 and 11.3, and is listed in Table 11.1.

11.9 All the zones within Halton, together with zones 31 (Sutton Weaver), 45 (Cronton), and 49 (Bold Heath) are connected to the network within the modelled area. The remaining 23 zones are located at points around the periphery of the network.

11.10 The vehicular trip matrices have been developed from the roadside origin and destination surveys undertaken in November 1999 by Oscar Faber. We received the interview records as Microsoft Word files, with all address information for trip origin and destination converted into postcodes. We converted the postcode information into the zoning system described above, and added expansion factors to each record to allow the information from the sample of drivers interviewed to be expanded to represent the total traffic crossing the Silver Jubilee Bridge on an average November weekday. The target flows required to calculate the expansion factors were based on the mix of vehicle types observed during the interviews and from earlier counts undertaken on the approaches to the bridge, and the total hourly flows averaged over several weekdays obtained from automatic traffic counters which were in place during the period of the surveys.

11.11 The significant depression in flows caused at peak periods when the surveys were undertaken was allowed for by discarding those days from the automatic traffic count record.

11.12 The northbound morning peak period (0700-1000) records were transposed to provide a source of information from which to derive assumed information for evening peak period (1600-1900) southbound traffic (which had not been interviewed). Similarly, northbound evening peak records were used to represent southbound morning records, and northbound off-peak records to represent southbound off-peak traffic. The vehicle mix for southbound traffic was taken from recent traffic counts on the Weston Point and Bridgewater Expressways close to the Queensway slip roads, and the target flows were derived from a November 1999 count carried out by Oscar Faber on the A557 southbound exit from the bridge, and an earlier automatic traffic count carried out on the bridge itself (which had a total flow within 1% of the November 1999 northbound flow across the bridge).

11.13 A number of interview records received from Oscar Faber for the two survey sites had no address information or address information for only the origin or the destination; a number had non-existent postcodes, and a numbers had both origin and destination on either the north side or south side of the river. The remaining records were used to form the trip matrices.

11.14 Five trip matrices were formed --
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- Trips with a ‘home’ end within Halton - Halton residents trips
- Trips with a ‘work’ end in Halton (but not a home end) – Halton employee trips
- Goods vehicle trips with a trip end in Halton – Halton HGV trips
- Other goods vehicle trips
- Other trips (cars without a Halton ‘home’ or ‘work’ purpose, and coaches)

11.15 Matrices were produced to represent the morning peak hour, the evening peak hour, and an average off peak hour. We assumed that the nature of traffic using the bridge would be broadly similar during the whole morning peak period (0700-1000), within the evening peak period (1600-1900), and within the off-peak period (1000-1600). All the interview data was thus used, but the expansion factors (by time period and vehicle type) were calculated such that the morning peak period interviews as a whole would be expanded to represent the morning peak hour (0800-0900), and similarly for the evening peak period and off-peak period interviews. Tabulations of the total vehicle matrices for each time period are included in the Appendix.

11.16 The roadside interview surveys provide information about traffic using the Bridge. Clearly, whilst such traffic makes up all the traffic on the bridge, and major proportions of the traffic on roads close to the bridge, there are significant flows of traffic on the roads within the modelled area which do not use the bridge. Whilst the detail of the movements which this traffic is making are not important in producing an accurate model, the presence of this traffic has a material influence on the routes used by bridge-crossing traffic and the speeds travelled at and delays suffered by bridge traffic at various locations in the modelled network. In the absence of real origin and destination information for non-bridge crossing traffic we needed an alternative mechanism to include this traffic in the trip matrices.

11.17 We employed a matrix estimation process to produce a representation of the non-bridge traffic. We brought together all the available traffic counting information for roads in the modelled area, collected since 1996, in order to produce a good coverage over the entire network. (This is included in the appendix for reference). Where available, morning peak hour, evening peak hour, and average off-peak hour total flows were extracted from this database to produce target flows for the matrix estimation process.
11.18 The process of adjusting a prior matrix to match observed link flows is complex, but the process can only adjust cells in the trip matrix which already include trips. Clearly, the bridge crossing matrices include values in cells which represent bridge crossing movements, but all the cells which represent trips wholly on the north side of the river, or wholly on the south side of the river contain zero trips in the bridge crossing matrices. In order to make use of the matrix estimating process, these non-crossing cells were ‘seeded’ with a nominal 5 trips in each cell. If no constraints are introduced into the process, the matrix estimating technique could vary the values in every cell of the matrix. The bridge-crossing information has been obtained from actual surveys, and so these cells were ‘frozen’ for the matrix estimation process, so that only non-bridge crossing cells could be altered to match observed counts.

11.19 The Bridge-crossing matrices (all five categories added together) were assigned to the networks and some preliminary refinements of the network coding carried out to ensure that Bridge traffic using the various approach and exit routes was approximately in balance. Then the matrix was ‘seeded’ as described above and the bridge crossing cells ‘frozen’. The matrix estimation process was then implemented, and a comparison made of the observed counts and the results of assigning the estimated matrix. Where routing errors were brought to light, small amendments were made to coding of elements of the network, and the process repeated. Once an acceptable fit between the observed counts and assigned flows had been obtained, the bridge-crossing matrix was subtracted from the total estimated matrix to leave a matrix of non-bridge crossing traffic.

11.20 Thus, in addition to the five different types of bridge-crossing matrices discussed above, the model also includes a simulated non-bridge crossing general traffic matrix.

11.21 Validation of the overall process was judged by comparing the observed and assigned flows on the various approaches and exits to the bridge, and the total flow crossing the bridge itself. Whilst traffic counts away from the proximity of the bridge had been used in the matrix estimation process, counts on the bridge and approaches (which do not include any non-bridge traffic) had not been used in that process, and can thus be regarded as an independent verification of the accuracy of the assignment of bridge-crossing traffic. Table 11.2 summarises these validation checks and indicates a very good fit between modelled flows and observed counts, and establishes the validity of the model for assessing river-crossing options.

**Future Modelling**

11.22 The base year models formed the basis for developing the future year models for 2010 and also 2025. The basic methodology adopted in developing the trip matrices for the future years has been described previously. In practice, separate matrices for the three time periods were prepared for each of 2010 and 2025, and for each journey type -- Halton residents, Halton employees, Halton HGVs, other HGVs, other cross-river traffic, and the simulated non-cross river traffic movements.
11.23 The purpose matrices were kept separate in order to allow the impact of designating the two crossings for different traffic types to be undertaken.

11.24 Future year networks were devised to represent the various scheme option scenarios, as described in the last Chapter, and the various trip matrices assigned to produce predicted link and turning flows for each test. The SATURN assignments also produce estimates of overall time expended (vehicle hours per hour) in making journeys, and distance covered (vehicle kilometres per hour) by vehicles in the modelled area. These figures, together with average traffic speeds were used to carry out the equivalent to a COBE cost benefit assessment for each of the scenarios.

11.25 In each case the assignments were carried out in two ways – firstly, with all traffic having a ‘free’ choice as to which bridge to use and, secondly, with ‘local’ traffic attracted to the Eastern Crossing and ‘sub-regional’ traffic attracted to the Silver Jubilee Bridge.

11.26 The second set of assignments were achieved by introducing nominal tolls or penalties to modelled links on each bridge. A nominal toll of £1 was assumed for all vehicles on the Silver Jubilee Bridge, with a 50p toll for Halton residents, employees and HGVs on the eastern bridge, and £2 for non-Halton HGVs and other river crossing trips on that bridge. In these assignments, virtually all the ‘Halton’ trips are assigned to the new crossing, and virtually all ‘non Halton’ trips take place via the Silver Jubilee Bridge.

11.27 The transport economics section of a later chapter explains why we are recommending that traffic should be allowed a free choice of bridge crossing, and the traffic flow information provided in the following paragraphs relates to the ‘free choice’ scenario.

11.28 Table 11.3 summarises the two way flows expected to cross each of the bridges on an average weekday in 2010 and 2025 at different times of the day, depending which scheme is implemented.

11.29 The table shows that, in the absence of a new crossing (Option 0 – Do Minimum) peak hour flows across the bridge will be constrained to much the same level as at present (6640 vehicles per hour), with growth taking place in the off-peak period, such that by 2025, the off-peak flow will be only about 500 vehicles per hour less than the peak flow.

11.30 If traffic flow across the bridge could be maintained at its peak level for the whole of the morning and evening three hour peak periods then by 2025, the bridge might be carrying up to 91,000 vehicles per day. Comparison with other options in the table indicates that at least 12,000 vehicles per day would need to transfer to other routes – primarily Thelwall Viaduct, to provide for the level of demand which the various scheme options would be carrying.
11.31 The table also indicates that some of the eastern options are more successful than others in attracting traffic away from the Silver Jubilee Bridge. Options 3, 5, and 5A (all with northern termination east of Albright and Wilson) attract more traffic than those which terminate west of Albright and Wilson.

11.32 The output from the traffic model was also used to develop the various junction arrangements included in each scheme option. Figures 11.5 to 11.8 summarise the predicted turning movements for 2025 expected to pass through a number of key junctions. In order to limit the number of variations presented, a robust set of turning flows is shown for each junction, based on the assigned flows predicted for each scheme option and time period. Sufficient analysis using these figures has been carried out to satisfy us that the basic junction forms shown in our preliminary scheme drawings are of an appropriate scale for the expected flows.

11.33 Data was also extracted from the model, to provide the necessary traffic flow and speed information to allow the noise and air quality assessments to be undertaken.
12. ASSESSMENT AND RANKING OF POTENTIAL SCHEMES – INTRODUCTION

12.1 Our comparative assessment of the various scheme options which have been under investigation in this study has been carried out generally in accordance with the DETR New Approach to Appraisal (NATA). That appraisal methodology was devised by DETR as part of the major review of the trunk road programme in 1998, and has subsequently been revised and extended to cover the assessment of multi-modal proposals.

12.2 The NATA approach provides a broader base to scheme appraisal than has previously been the case, and attempts to avoid an over-concentration on elements which lend themselves to numerical quantification. The system considers the impact of proposal against the government’s over-arching objectives for transport, which are –

- To protect and enhance the built and natural environment
- To improve safety for all travellers
- To contribute to an efficient economy, and support sustainable economic growth in appropriate locations
- To promote accessibility to everyday facilities for all, especially those without a car; and
- To promote integration of all forms of transport and land-use planning, leading to a better, more efficient transport system.

12.3 Within each of these five main objective areas, the NATA system identifies a number of subsidiary objectives or issues. For example, the environment objective includes six subsidiary areas –

- Noise
- Air Quality
- Landscape
- Biodiversity
- Heritage, and
- Water

12.4 Economy is considered in terms of –

- Road users’ journey times and vehicle operating costs
- Construction, land, preparation and maintenance costs
- Road users’ journey time reliability, and
- Support for regeneration objectives.
12.5 Clearly, the policies and priorities of individual local authorities will vary from those of central government, but in most cases, the five policy areas of environment, safety, economy, accessibility, and integration are regarded as highly important.

12.6 In carrying out our assessment of the various Mersey Crossing options, we have generally followed the NATA guidelines, but modified these to take account of the specific circumstances of the situation, and the level of detail appropriate for this stage of the scheme's development. In particular, the results of a NATA appraisal are brought together in an Assessment Summary Table (AST) - a single page which summarises the impacts of a scheme or a scheme option. One of the intentions of the AST is to make scheme comparisons easier, and it is this approach we have adopted in order to home in on preferred options.

12.7 The following Chapters of the report consider the various elements of the appraisal, in a similar sequence to that set out in the NATA guidance and AST.
13. **ASSESSMENT OF ENVIRONMENTAL ISSUES**

**NOISE AND AIR QUALITY ASSESSMENT**

*Methodology*

13.1 The Transport White Paper "A New Deal for Transport: Better for Everyone" was published in 1998. This provided the impetus for the development of the New Approach To Appraisal (NATA), which provides a clear framework to appraise and inform the prioritisation of road investment. The framework was initially developed to appraise the road schemes in the trunk road programme but the intention is that its use should be extended to cover the appraisal of all road schemes. One of the five criteria included in the NATA Assessment is environmental impact, which includes noise and air quality.

*Noise*

*Design Manual for Roads and Bridges*

13.2 Noise levels have been calculated in accordance with the prediction method set out in the Department of Transport’s “Calculation of Road Traffic Noise” 1988 (CRTN). The traffic flow predictions used in these calculations are set out in Tables 13.1 and 13.2. (Note – because of the similarity between the traffic impact of various options, flows for Option 2 are representative of all West of Albright & Wilson schemes, and flows for Option 5 may be taken to represent all East of Albright & Wilson schemes, insofar as noise and air quality assessment is concerned). The predicted noise levels were then assessed using the methodology set out in the Design Manual for Roads and Bridges. This introduces a complex requirement to estimate the change in noise nuisance resulting from road schemes. A series of charts and tables is provided, which are based upon research described in chapter 3 of volume 11, section 3 part 7 of DMRB. This allows assessment of sudden changes, i.e. on opening; and long term changes, i.e. over the period up to the design year.
New Approach to Appraisal Framework

13.3 The NATA methodology requires a quantitative assessment of noise impact. This is to be achieved as recommended in the Design Manual for Roads and Bridges (DMRB) 11.3.7 by calculating the levels of traffic noise in terms of the 18 hour L10 index (the noise level exceeded for only 10% of the time between 6am and midnight) using the Department of Transport’s “Calculation of Road Traffic Noise”. This is to be carried out at selected properties for the fifteenth year after the scheme opening or the year in which traffic flows are expected to be greatest, if earlier. These predicted noise levels are then used as a guide to the number of properties in various noise exposure bands and noise change bands. The number of these properties where there has been a significant change is obtained by counting those where the noise level changes by 3 decibels or more. An assessment is required for all properties where the noise climate is likely to be significantly different if the proposal is implemented. Parallel calculations are required for the do minimum option as well as for the proposal itself.

Air quality

DMRB

13.4 Airborne pollutants associated with road traffic were assessed using the methods given in the DETR Design Manual for Roads and Bridges Volume 11, Section 3, Part 1 (DMRB), May 1999. Three methods are listed in this document as

- a localised air quality impact,
- a generalised assessment of local air quality as described in the Department of the Environment, Transport and the Regions’ Guidance, on the New Approach to Appraisal (July 1998) and
- a regional air quality assessment.

13.5 As at this stage the full extent of the impact of the new river crossing on the road traffic network is not known it was not possible define the full scope of the study area. The assessment was therefore restricted to the first two assessment methods, but information extracted from the SATURN traffic model gives a general indication as to the overall impact on air quality.

Localised air quality

13.6 Using this method, concentrations of carbon monoxide, 1,3-butadiene, benzene, nitrogen dioxide and particles were calculated at sensitive locations which in this scheme are dwellings and a school within 200metres of existing or new roads. Five typical locations were considered. Two properties were in West Bank and three were in Runcorn. The addresses of the properties examined were tabulated in Chapter 9.
The maximum 8-hour mean concentration was derived for carbon monoxide. The annual mean concentrations were derived for benzene and 1,3 butadiene. The annual mean and the 95th percentile of the hourly mean concentrations were calculated for nitrogen dioxide, the 95th percentile of the 24-hourly means were derived for particles or PM10 (Particulate matter less than 10 microns in diameter). Different concentration averaging times were used for different pollutants so that the estimated concentrations could be compared directly with the National Air Quality Objectives. These estimates were based upon forecast traffic flows, speed and composition, (i.e. the number of heavy goods vehicles) and the distance, between the road, or roads and a particular property. Background concentrations were taken into account by adding them to the concentration expected from the road traffic. In the event that a local background is not available the methodology advises the use of the default, annual mean background concentrations. The concentrations of the pollutants were calculated for the existing, taken as 1999, with and without the proposed new River crossing in 2010, and with and without the proposed new crossing in 2025.

**Generalised assessment of local air quality**

Quantification of the change in exposure to be expected by persons near the scheme was carried out in two stages. The first was to estimate roadside concentrations of NO2 and PM10 for 2010 on the existing route for the do minimum and the other options.

The second stage was to quantify the exposure to the change in terms of a property count between Lower Church Street in West Bank and the Bridgewater Canal in Runcorn. Properties were banded and the number of properties within each band recorded. The bands recommended by the Guidance relate to the diminishing contribution that vehicle emission make to the local air quality.

The bands were defined as:
- Roadside to 50 m from roadside
- 50 m - 100 m from roadside
- 100 m - 150 m from roadside
- 150m - 200 m from roadside

Beyond 200 m the contribution of vehicle emissions from the roadside to local pollution levels is not significant.

The number of properties in each band was then weighted according to the pollutant being considered. The weighted numbers in each of the four bands were added to give the total weighted number within 200 m and then multiplied by the roadside pollutant concentration to give a measure of the impact.
Environmental Criteria

Noise

13.13 Noise levels were assessed both in terms of the absolute level as well as the change in the level from the opening of the new road. Which one, depends upon the situation.

-Insulation

13.14 When the noise level increases by 1 decibel or more along an altered highway and the future noise level is 68 dB(A) or more [18 hour L10] then bedrooms and living rooms in affected dwellings qualify for additional noise control measures including ventilation if required. The impact can therefore be assessed in terms of the cost of remedial measures.

-Impact

13.15 The general assessment of traffic noise levels and changes is for average weekday conditions. This follows DMRB advice and classifies the relevant locations according to their use. In addition, DMRB requires the comparative frameworks to be made according to ambient A weighted noise levels in terms of L10 (18 hour), in bands of

- below 50 dB
- 50 to < 60 dB
- 60 to < 70 dB
- 70 dB or more

13.16 For each noise band, a count was made of the number of dwellings and other noise sensitive locations subject to a change in noise level of 3dB or more. The higher the number of properties the worse the impact.

Air Quality

13.17 Following the guidance given in DMRB (1999) for assessing local air quality impact; the concentrations of the five pollutants calculated for the existing situation, for 1999, 2010 and for 2025 were compared directly with the air quality objectives given in the National Air Quality Strategy (NAQS) for 2005. These are reproduced in Table 13.3.

13.18 Comparisons for years prior to 2005 will be unduly pessimistic because the objectives do not have to be met for several years ahead. Comparisons for 2010 should be valid on the assumption that there are no revisions to the objectives.
13.19 Following the methodology set out in the generalised assessment of local air quality, the estimated roadside annual mean nitrogen dioxide concentrations for 2010 were compared directly with the corresponding National Air Quality Objectives of 21 ppb (parts per billion). Where this occurred, and where the increase between do minimum and do something was more than 2 ppb, qualitative comments about the particular section of the road were entered in the assessment worksheet. Similarly, with PM10, in situations where the concentrations increased by more than 2 μg/m³ (micrograms per cubic metre) between the do minimum and do something, a qualitative comment was also triggered. These and similar comments were summarised in the Appraisal Summary Table (see Chapter 16).

Existing Environmental Conditions

13.20 Estimates of the current environmental noise and air quality have been obtained using the assessment methods described above. This provides a baseline for establishing future trends.

Noise

13.21 The predicted existing 18 hour noise levels at the positions considered are given in Table 13.4.

Air Quality

13.22 The localised air quality for the current situation (1999) is summarised in Table 13.5.

Assessment Of Future Environmental Conditions

Noise

13.23 The predicted 18 hour noise levels in the design year, 2025, at the positions considered are summarised in Table 13.6 for each of the options examined. The corresponding changes in noise nuisance for 2010 and 2025 are illustrated in Table 13.7.

13.24 In terms of future noise levels there is very little to choose between the options considered. Differences in noise levels are generally less than one decibel. The main reason for this is that the differences in traffic flows on the bridge between the do minimum option and the other options are relatively small. There is a predicted decrease in the 18 hour traffic flow rate of about 25% for option 2 and 29% decrease for option 5. This change in the traffic flow rate would normally result in a reduction of about one decibel, however this has been cancelled out by the significant increase in speed and the increase in percentage of heavy vehicles expected. The increase in traffic flow rate for option 6 is only about 12% and therefore the expected change in noise level will be very small.
13.25 As there will not be any properties with a significant increase in noise level, ie 3 decibels or more, noise is not an important issue in the New Approach to Appraisal Framework for assessing between options.

13.26 At and shortly after the opening of the new crossing in 2010 there will be a significant change in the number of people bothered very much or quite a lot from the existing situation. During this period option 6 would probably have the most impact followed by option 2, then option 5. However this change will almost disappear by 2025 when only a few percent will be bothered more than at present. The difference in noise nuisance between the various options is virtually undetectable by the design year, thus confirming that there is little difference between the options in terms of traffic noise.

**Air Quality**

13.27 Future air quality at the five assessment locations resulting from the options considered is summarised in Table 13.8

13.28 Corresponding estimates for 2025 are summarised in Table 13.9.

13.29 Table 13.10 shows the trends in air quality at the five assessment locations between now and 2025 with no new river crossing.

13.30 This analysis suggests that there will be an improvement in air quality over time without a new river crossing. However only one of the locations considered (B), will achieve the air quality objective. The other locations will continue with poor air quality in terms of nitrogen dioxide and PM10.

13.31 Option 2, a new crossing from Astmoor to west of Albright and Wilson with south to west and west to south turns introduced at Ashley Way and option 5, Central Expressway to East of Albright Wilson will improve air quality over the do minimum option. Of these two option 5 will be slightly more beneficial in terms of air quality improvement. Option 6, a second bridge between the existing bridge and the railway bridge will improve air quality slightly over a do minimum option for properties to the east of the existing bridge. But it will make matters worse for properties to the west of the existing bridge.

13.32 The more generalised assessment of local air quality, which is summarised in Table 13.11 supports these findings. Negative values indicate an improvement in air quality and the larger the value the greater the benefit. Options 2 and 5 give the largest improvement in air quality on both indices. Overall there is significantly less improvement for option 6.

**Mitigating Measures**

13.33 As the increases in noise levels are not expected to be significant, mitigating measures are not required. However future environmental studies of the preferred option should take a more detailed review of possible mitigation.
13.34 Similarly with air quality, as an improvement is expected mitigation measures are not justified.

Option Comparison

Noise

13.35 In terms of future noise levels there is very little to choose between the options considered. The main reason for this is that the differences in the traffic flows between the do minimum option and the other options are small. Eighteen hour noise levels will generally change by less than one decibel.

13.36 At and shortly after the opening of the new crossing in 2010 there will be a significant change in the number of people bothered very much or quite a lot from the existing situation. During this period option 6 would probably have the least beneficial impact followed by option 2, then option 5. However this change will almost disappear by 2025 when only a few percent will be bothered more than at present. The difference in noise nuisance between the various options is virtually undetectable by the design year, thus confirming that there is little difference between the options in terms of traffic noise.

Air Quality

13.37 Air quality is currently poor for the residential areas within 200m of the existing bridge. It will improve over time as emission control legislation and emission control technologies have the desired effect. However with the anticipated growth in traffic this trend will eventually become smaller and smaller. Options 2 and 5 bring the greatest improvement in air quality for the properties in West Bank and in Runcorn close to the existing bridge. Option 6 will also improve air quality but to a lesser extent as the improvement on the eastern side of the bridge will be partially offset by a slight deterioration in air quality to the west of the existing bridge. Whatever option is adopted air quality will remain relatively poor in the study area. Any new crossing will improve air quality over a do minimum option.

ECOLOGY AND NATURE CONSERVATION ASSESSMENT

Methodology

13.38 The ecological aspects of the study have been considered through desk study and an objective assessment of the existing ecological sensitivity and importance of the local area. This approach has involved a thorough review of the Oscar Faber report (New Mersey Crossing Study: Stage 2 Report February 1999) and the Mott MacDonald report (Second Mersey Crossing at Runcorn Review of Options: June 1999).
13.39 Due to the scale of the proposals and the ecologically sensitive location, it was considered prudent to discuss in a preliminary manner the main issues that the statutory consultees, in particular, the Environment Agency and English Nature. This was undertaken given the likelihood that such a development would be deemed "EIA development" in accordance with the EIA Regulations 1999.

13.40 Given the current assessment stage and project brief, no ecological field surveys have been undertaken as part of this project as the extent and detail of these will be considered by the local authorities concerned, the EA and EN at the formal "Scoping Opinion" stage of the development. It is possible, however, at this stage to pre-empt generic requirements in order to differentiate if possible between the options identified, based on the main discussion points raised at meetings held with these organisations.

13.41 In order to evaluate the potential ecological consequences of the proposed options, an objective assessment has been undertaken by using the methodology set out in the New Approach To Appraisal (NATA, DETR 1998). This assesses the level of impact based on two main factors: the type and severity of the impact and the scale of the importance of the nature conservation feature by initially assigning a comparative ecological value to the habitats along the route. This has been expressed mainly in terms of its level of importance relating to the species diversity and presence of any uncommon species, but has also taken account of factors such as its size, rarity, naturalness, biodiversity, contiguity with other sites, history and uniqueness (Ratcliffe criteria 1977).

13.42 The assessment score takes account of the nature conservation evaluation Category that the site falls under and the type (adverse, beneficial; indirect, direct; short-term, long-term; individual, cumulative) and severity of the ecological impact. The intermediate scale of impact has not been used for this stage of the assessment, as given the level of information available, it is not possible to assess whether the integrity of each site has been affected.

13.43 A summary NATA table (Table 13.12) has been prepared for the main nature conservation features that occur in the study area that could potentially be affected by the proposed crossing. At this initial stage in the assessment, the NATA is inconclusive in its findings as there is insufficient information to accurately assess all the potential impacts. Sufficient information has been collated and reviewed in order to meet the study objectives.

Assessment And Ranking Of Potential Schemes

Potential Impacts

13.44 As an arbitrary guide and in order to attempt to differentiate between the various options on ecological grounds, we have calculated the approximate saltmarsh habitat losses of the two main channel crossings. These are given below:

- Astmoor to West of Albright and Wilson: 0.88 ha loss to Widnes Warth Marshes and 0.2 ha loss to Astmoor Marsh
Central Expressway to East of Albright and Wilson: 1.44 ha loss to Widnes Warth Marshes and 0.6 ha loss to Astmoor Marsh

13.45 These are significant losses in terms of direct habitat destruction and are against local planning policy.

13.46 The use of embankments instead of piers has been considered across the marshes either side of the main channel width. Any embankment proposals across the marshes to the north or south are likely to receive objections from both the EA and EN due to the direct loss of these habitats (floodplain) and the impacts upon channel capacity and geomorphological processes.

13.47 The embankment option would result in the loss of the saltmarsh on Widnes Warth which although it has no statutory protection, it is protected by local planning policy and it could be used as a low tide feeding and roosting site by birds that frequent the SSSI. Any potential reduction in feeding and roosting sites for species that use the SSSI downstream, would not be acceptable to English Nature (refer to Habitat Regulations implications below).

13.48 The generic construction impacts that could arise as a result of any of the eastern crossings under consideration are given below:

- increase in noise levels and increase in frequency;
- general disturbance through the level of activity over the river;
- increased vibration;
- increased turbidity and release of contaminants that are currently “locked” into deep sediments but will be released into the water column through deep piling activities and could be carried downstream into the SSSI, SPA and Ramsar;
- direct loss and/or damage to habitats that are of District or Local value, direct loss of a portion of the Widnes Warth/Astmoor saltmarshs through construction of an embankment;
- indirect effects upon bird behaviour, feeding and roosting patterns which could ultimately effect the integrity of the SSSI, SPA and Ramsar;
- direct and indirect effects on fisheries;
- downward migration of contaminants around the edges of the piers providing a pathway into the sandstone.

13.49 The generic operational impacts that could arise are given below:

- alteration to the natural fluvial geomorphological processes of the river. These potential changes in erosion and accretion patterns and the fixed navigation channel could potentially reduce the amount of saltmarsh and mud flat habitats exposed at low tide and ultimately affect the integrity of the SSSI, SPA and Ramsar site downstream;
the embankment proposals are likely to go against the Estuary Strategy for sustainable development;

Changes in flow regime around the piers may increase scour and increase erosion of the sediments that could overtime release contaminants otherwise trapped in the river bed. This could have adverse impacts upon the water quality of the area and in the long term the fisheries interest and associated invertebrates and botanical communities. These contaminants could be carried downstream and enter the SSSI;

The piers could create migration pathways through the sediments for contaminants to enter the underlying aquifer.

*Habitat Regulations 1994 Implications*

13.50 Given the European status of the Mersey Estuary SSSI as a Special Protection Area and Ramsar site, it is likely that either eastern crossing would fall within an “appropriate assessment” consultation area (PPG 9 states that a 2km radius is often considered).

13.51 Regulation 48 of the Habitat Regulations 1994 requires that, where a development may have significant effects on a European site of nature conservation, a competent authority must undertake an appropriate assessment of the implications for the site in view of the site’s conservation objectives. The basis of the assessment must be to determine whether the integrity of the site will be affected. The coherence of the ecological structure and function of the site must be secure, which in turn enables habitat complexes and population numbers to be sustained.

13.52 There are a number of issues to be considered within the assessment:

- The direct effects of habitat loss/change as a result of the proposed crossing on the SPA;
- Indirect effects, for example of noise, disturbance and pollution on habitats and species of the SPA;
- The effects of construction and operation of the new bridge;
- The potential for cumulative effects of other developments in adjacent authorities.

13.53 In the context of an appropriate assessment, it is essential to evaluate the contribution that the habitats that could be affected by the crossings, some of which are SBIs, make to the SPA and the inter-relationships between them. For example, the marshes may act as buffer sites for the SPA in providing feeding or roosting habitat in certain weather conditions and in providing additional foraging habitat. It is therefore necessary to assess the impacts of the loss of the SBIs on the wintering bird populations using the estuary to ensure that this loss would not compromise the SPA designation. In order to undertake this rigorous assessment extensive bird records would be required.
13.54 A separate issue to consider is the contamination status of Wigg Island. This is considered fully earlier in the report. In summary, the site investigation revealed in excess of 12m depth of fill materials overlying silty clays, silty sand and sandy gravel (alluvium). Red sandstone was encountered at a depth of between 10-15m bgl but it is likely to be deeper than this in the main river. Any works across Wigg Island could therefore require major reclamation works to treat the contamination issues and contaminant resistant construction materials would be required. Large adverse impacts associated with the release of contaminants into the water column and potentially their downward migration into the aquifer could have long term consequences for the estuary.

13.55 Direct impacts associated with the introduction of previously buried contaminants within the sediments into the water column are clearly an issue for the specific crossing locations during construction associated with the installation of piers, however, the wider impacts should also be addressed. For example, when considering the alteration of flow regime within the channel, the geomorphological processes of erosion and accretion could also be affected both upstream and downstream of the crossings extending potential water quality impacts to the SSSI, SPA and Ramsar site. The fixing of a navigation channel and the introduction of several piers in the channel will alter the existing dynamics of the flow regime possibly to the extent that the potential for increased scour at points downstream of the existing Runcorn Bridge cannot be discounted until hydraulic or physical models identify whether this is a realistic scenario.

13.56 The EA consider that any losses to the saltmarsh habitat in the Mersey Estuary takes on a greater value when losses which are not directly development related, such as global warming and the predicted rise in sea levels will affect the biodiversity of the estuary. Any accumulation of this loss is unlikely to be acceptable.

13.57 Planning policies are discussed in chapter 3 of this report but, it is important to state within this section the local planning policy protection that is afforded to ecologically important sites. Policy NE 7 will not allow development which may destroy or give rise to any significant adverse effect on designated SSSI, either directly or indirectly. Under policy NE 8 development will not be allowed on SBIs if it is likely to cause significant harm to the features of biological importance for which the sites are designated.
New Approach To Appraisal

13.58 In accordance with NATA all sites that host habitats/species of European Community interest (Annex 1 and 2 of Habitats Directive), Bern and Bonn Conventions and those that are either Ramsar Sites (Convention of International Importance especially as Waterfowl Habitat 1971) or European Sites (in accordance with the Habitats Regulations 1994) are considered as Category A sites. As such any major impact on this category of site would result in a Very Large Adverse impact. With respect to all Very Large Adverse impacts in relation to Category A sites this methodology identifies such proposals as likely to be unacceptable on nature conservation grounds alone, even after mitigation measures are incorporated.

13.59 Direct losses and damage to the saltmarshes to the north and south of the river channel are likely. These marshes are categorised as Category C or possibly Category B sites (due to their non-statutory protection as Sites of Biological Interest) and the high potential for these habitats to support protected species (under Schedules 1, 5 and 8 of the Wildlife and Countryside Act 1981) or Red Data Book species. As such the lowest level of impact (Category C with a major impact due to the direct loss of large areas of saltmarsh) would result in Large Adverse impacts as given the locality these habitats if lost are not readily substitutable.

13.60 In summary, our assessment findings are:

- It is not possible to differentiate or rank the proposed options due to the lack of site specific survey data;
- Any crossing is likely to have very large to large adverse impacts during construction, the severity and type of these impacts cannot be quantified given the information currently available. It is understood that insufficient information is available for benthic invertebrates and other aquatic flora and fauna, therefore extensive surveys and data collection would be required. Impacts are likely to arise from the release of contaminants into the water column, the artificial fixing of the main navigation channel and loss of saltmarsh and mudflat habitats which could all result in severe long term consequences for the estuary;
- It is likely that English Nature would require an appropriate assessment under regulation 48 of the Habitats Regulations 1994. It will be necessary to identify that the integrity of the SSSI, SPA and Ramsar site is not adversely affected and that the nature conservation objectives for the site are not compromised;
- The proposals are likely to be subject to the new EIA Regulations 1999 (Schedule 2: area of works exceeds 1 hectare; Schedule 1: road of 4 lanes or more over a distance of 10 km).

13.61 The most acceptable alternatives to a bridge crossing to the east of the existing Runcorn Bridge, which have not been included as part of this assessment, include:
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- A central option where the bridge would run parallel to the existing with parallel piers;
- A cable stay design to obviate the need for piers within the main channel;
- Suspension bridge design to obviate the need for piers within the main channel.

13.62 The central option would be situated adjacent to the existing Mersey crossing between Runcorn and Widnes. This option is preferred to the two eastern options for the following reasons:

Construction

- There would be no direct losses to Astmoor Marshes and Widnes Warth SBIs since between these points there is a natural pinch-point comprising local bedrock. Indirect impacts upon the St Helens Canal and other SBIs (Fiddlers Ferry Saltmarsh) would also be reduced;

- The effect on migratory birds, for which the Mersey estuary achieves its RAMSAR/SPA status, is also likely to be less than the eastern options. Any disturbance that may result through construction could be further minimised by careful timing of works so that it does not coincide with the arrival/presence of migratory birds;

- There may be a greater level of general disturbance during construction due to the closer proximity to the RAMSAR/SPA caused by vibration and noise although this must be considered in relation with the significantly shorter construction period and there being no loss of potential feeding or roosting areas for birds which use the RAMSAR and SPA downstream;

- There is likely to be less impact on the fisheries and invertebrates as the level of silt entering the water column will be reduced due to fewer piers being required. Likewise, due to there being fewer piers and if bedrock is shallower at this location, the risks associated with very deep piles and the transfer of contaminants into the underlying aquifers will be much reduced.

- It is also less probable that a major release of contaminants from sediments will occur as the crossing would not necessitate the disturbance of large areas of estuary muds, which are not known to be significantly contaminated (unlike Astmoor Marshes and Widnes Warth) due to the reduced number of piers. In addition, the flow regime and natural processes in this part of the river are likely to be highly erosive due to the fixed artificial walls either side of the channel (Ship Canal Wall to south, Spike island to north) and therefore deeply buried contaminants are less likely to be present compared to the eastern crossing;
Operation

- With careful planning and design, the impact of the new crossing could also be minimised by the piers being placed in parallel to the piers of the two existing crossings. This would minimise any alteration in the hydrodynamics of the estuary and therefore minimise the possible effects that may occur within the Mersey estuary SSSI, SPA and RAMSAR.

- Operational impacts associated with noise, air emissions and lighting are likely to be less significant in relation to the nature conservation interests of the area due to the presence of the existing bridge and the ability for many bird species to become familiarised with these disturbance factors.

ASSESSMENT OF RIVER ISSUES - ESTUARY HYDRAULICS AND NAVIGATION

Estuary Hydraulics

Overview

13.63 Any crossing that involves placing piers or other structures, whether temporary or permanent, within the tidal estuary will have an impact on the dynamic regime of the estuary.

13.64 Key factors in determining the nature, scale and extent of the impacts resulting from a new crossing of the estuary include:

- The overall length of the crossing within the estuary and, more markedly, the length of the crossing between Mean High Water marks on each bank.

- The configuration of the crossing, in particular the number, size and location of the piers, as these determine the obstruction that the bridge presents to the natural ebb and flow of the estuary.

- The alignment of the crossing in relation to the low water channels, sandbanks and saltmarsh and the degree to which the channels are naturally mobile in the vicinity of the crossing.

13.65 Only very broad qualitative assessments of the impacts can be made through considering these factors at this stage. However, for quantitative assessments of the impacts that would allow these qualitative assessments to be refined and a comparison of alternative alignments and configurations to be made, a programme of estuarine studies, including hydraulic modelling, will be needed as described towards the end of this report.

Option Assessment

13.66 For the purposes of this report, alternative connections to the existing road network have been considered both West and East of Albright and Wilson, at the Astmoor Interchange and at the Central Expressway. These four possible connections, two on the North Bank and two on the South Bank, provide four possible broad alignments.
13.67 However, all these alternative alignments would involve crossing the estuary at its widest point above Runcorn in an area where the low flow channels are subject continually to natural variations and movement. All four alternative alignments, therefore, have the potential to cause significant impacts on the dynamic regime of the river.

13.68 The length of these crossings over the Estuary and Ship Canal would be in the order of 1.5km to 1.7km. It is envisaged that the most appropriate form of construction would be a multiple-span bridge with spans up to 100m.

13.69 The extent of impacts on the estuary and the consequent ranking of alternative alignments and bridge configurations can only be established following a programme of hydraulic modelling as described later in the report.

13.70 At this stage, there is little to choose between the four alternative alignments in terms of likely impacts but all would have greater impacts on the estuary than the much shorter crossings that would be possible at Runcorn Gap or Cuerdley Marsh.

13.71 A multiple-span bridge with many piers within the estuary, obviously, would have greater impact than a single, clear-span bridge. However, increasing the span and reducing the number of piers helps reduce the impact, subject to local effects that may be caused by the particular location of individual piers.

**Navigation**

13.72 If navigational clearances, as discussed in Chapter 7, are provided equally on the alternative crossing options, the comparative assessment and appraisal of the alternative schemes will not be influenced by navigational issues.

13.73 The hydraulic modelling of alternative schemes, however, may demonstrate different impacts on the sedimentation patterns within the estuary. If the new crossing results in increased deposition within the navigable channels, it may be necessary to undertake maintenance dredging to keep the channels open. This would be an ongoing commitment that would increase the operational costs of the crossing.

13.74 In terms of navigation, there is little difference to be seen at this stage between the four alternative alignments considered for this report. The proposed navigation span of 100m over the Ship Canal would be satisfactory.

13.75 There may be consequences for navigation, arising from changes to the hydraulic regime that may be revealed by the hydraulic modelling programme. However, any differences between the four alternative alignments are likely to be small in terms of their impact on navigation.
14. ASSESSMENT OF SAFETY AND ECONOMY ISSUES

TRANSPORT ECONOMICS AND SAFETY

14.1 The principal source of information for the assessment of transport safety and economy has been the SATURN traffic model. The development of the model has been described in earlier sections of this report, as has an overview of the traffic assignments to the various scheme options.

Safety

14.2 A detailed study of the present accident record of the Silver Jubilee Bridge and the rest of the Halton road network has not been undertaken as part of this study. It will be more appropriate for such detailed analysis to be carried out once the preferred scheme has been established and issues are being addressed at a more detailed level.

14.3 Instead we have simply considered the extent to which the introduction of a new crossing would reduce the overall distance travelled within the modelled network. This should be a reasonable proxy for accident savings given that the new crossing would be built to a similar standard to the roads from which traffic would be relieved, and can therefore be assumed to demonstrate a similar accident rate.

14.4 Examination of the summary statistics from the SATURN assignments indicate that all schemes are expected to reduce the overall distance travelled in the network by 1% to 2%. All scheme options can thus be expected to have a small positive impact on road safety.

14.5 At this stage we can only provide this qualitative assessment — insufficient information is available to quantify the predicted change in terms of reductions in fatal, serious, or slight casualties, or to translate the saving into a monetary value.

Journey Times, Vehicle Operating Costs, and Reliability

14.6 Changes in Journey Times and Vehicle Operating costs have been deduced from information abstracted from the SATURN traffic model. Rather than developing a separate COBA model at this stage of the scheme assessment, we have carried out an equivalent cost benefit calculation using a spreadsheet approach.

14.7 The SATURN assignment summary statistics provide information of network wide time and distance expended in terms of values of vehicle hours and vehicle kilometres for each of the modelled time periods.
14.8 Values for total vehicle kilometres, vehicle hours, and average speeds were extracted for each trip purpose, for each of the three time periods, for 1999, 2010, and 2025, for each scheme test option, and for the ‘free route choice’ and ‘local/non-local bridge allocation’ scenarios. Using values provided in the DETR’s Highways Economic Note 2 (HEN2), these basic parameters were converted into values of time and vehicle operating costs (at 1994 price levels). The values for each time period where then combined to produce 24 hr values of vehicle operating and journey time costs, and these daily totals were then expanded to form annual totals.

14.9 Values for the years 2010 and 2025 were derived directly from the assignments. Values for intervening years were derived by linear interpolation. In order to provide values for years beyond 2025 to provide a full 30-year evaluation period, a cautious approach was taken in that values for years beyond 2025 were assumed to be the same as for 2025 – in effect no further traffic growth after 2025 was assumed.

14.10 All the evaluations were than discounted at the standard 6% discount rate to the COBA current year (2000), so as to put the results on an even footing to schemes assessed using COBA.

14.11 The final steps of the analysis are shown in Table 14.1 for the ‘free choice’ of bridge assessment and in Table 14.2 for the local/non-local split (differential tolling) scenario.

14.12 These tables show the cost of journey time and operation of vehicles for each of the thirty years from the opening year (2010) to the thirtieth year after opening (2040). The left half of the table indicates the actual values (at 1994 prices) for each scheme option. The right hand part of each table shows the same values discounted at an annual rate of 6%. The thirty year discounted total time and operating costs are shown at the bottom right of the tables; the present value of benefits (PVB) of each scheme is merely the difference between the total cost for Test 0 (the Do Minimum scheme) and each individual alternative option. (These figures have then been transferred to the Assessment Summary Table included in Chapter 16). Table 14.1 indicates that these benefits would be worth between £71m and £131m depending on which scheme was implemented, assuming drivers were allowed a free choice of bridge crossing. The greater benefits are shown by schemes which terminate east rather than west of Albright & Wilson on the north bank, and at the Central Expressway rather than Astmoor West on the south bank.
14.13 Table 14.2 shows, however, that if drivers' choice was limited, requiring local traffic to use the new eastern crossing whilst non-local traffic used the Silver Jubilee Bridge (for example, through differential tolling), then the PVB of the scheme would be severely reduced. Indeed, the table indicates that (except in the case of Option 5A (Central Expressway to East of Albright & Wilson, with grade separation) the 'benefit' would be negative – that is, vehicle operating costs and journey times would, overall, increase when compared with the Do Minimum situation, by over £200m (over 30 years, discounted) in the case of the West of Albright & Wilson schemes.

14.14 A closer examination of the traffic assignments for the local/non-local split scenarios indicates that this arrangement leads to significant increases in flow and congestion in Widnes Town centre, as cross-river traffic from Ditton/Hough Green and the Birchfield Road area of Widnes would pass through the town centre to reach the eastern crossing, rather than taking a more direct route to the Silver Jubilee Bridge. Whist these options do provide a greater degree of relief to the Silver Jubilee Bridge than the 'free choice' scenario, they result in a poorer environment in Widnes Town centre, and increases in journey times and operating costs. We have, therefore, concluded that there may be significant disadvantage in attempting to separate local from non-local traffic, and have based the remainder of the assessment on the 'free choice' options.

14.15 The Assessment Summary Table (AST) included in Chapter 16 includes a number of parameters based on this analysis of journey times and vehicle operating costs. The table shows (for each scheme option) the overall daily study area time expended in 2010 in terms of vehicle hours for each scheme. It indicates that without a new bridge, about 56,200 vehicle hours will be expended per day in 2010. The various schemes reduce the time spent by between 12% and 17% (that is, an eighth and a sixth). Schemes terminating east of Albright and Wilson give rise to the largest reduction with other schemes (including duplicating the existing bridge) producing results at the lower end of the range.

14.16 The table also indicates the average speed of traffic over the day as a whole in 2010. In the Do Minimum situation, the average speed is about 52 kph. The various schemes increase this by between 9 and 14%, the biggest increase being achieved by the Central Expressway to East of Albright & Wilson options, with the Astmoor to West of Albright & Wilson, and existing bridge duplication options producing results at the lower end of the range.

14.17 Table 14.3 provides further information on journey time savings at a zone to zone level, for one of the scheme options. Whilst there is some variation between options, the table shows the general impact on morning peak hour journey times of the provision of a second crossing. In general terms, in 2010, a second crossing can be expected to bring about a saving of around 13 minutes on most morning peak hour trips which cross the river.
14.18 We have carried out an assessment of journey time reliability in accordance with the DETR guidance. Firstly, we assessed the Congestion Reference Flow (CRF) for each bridge crossing. The CRF is the highest sustainable hourly flow in good conditions beyond which flow becomes unstable and congestion occurs. We then assessed the 'stress' level for each crossing in each option, where 'stress' is the ratio of predicted flow to CRF. Finally we compared the change in overall stress between the different scenarios to produce a qualitative statement on journey time reliability (as set out in the DETR guidance on NATA). In all cases the scheme options result in moderate or moderate to large beneficial impact on journey time reliability, as set out in the AST.

Scheme Costs

14.19 We have developed preliminary cost estimates for the various scenarios under test. The estimates are based on rates derived from recent contracts, and on quantities estimated from our drawings.

14.20 Overall, our cost estimates include for the construction of the new crossing and its approaches, terminal junctions and other modifications to the highway network. In addition, estimates of land costs are included, together with design, preparation, and construction supervision costs, and we have also made an allowance for ongoing maintenance costs. No information on statutory undertakers' equipment or diversion costs has been obtained at this stage. However, our estimates do include a typically 30% contingency to allow for minor items and variations from our rates. This contingency would also allow for ground conditions to be slightly worse than we have assumed, but particularly poor ground conditions would increase actual costs to beyond our preliminary estimates.

14.21 Land and property estimates have been produced by Lambert Smith Hampton, property consultants within the WS Atkins group, and take account of the size and form of construction of property which might be required for each option. A contingency has been included to allow for disturbance and other costs. However, it has been assumed that each affected business is free-standing – ie compensation costs will relate only to the directly affected properties – possible impacts on other businesses in the area have not been included.

14.22 The overall cost estimates for each scheme option are shown in Tables 14.4 to 14.12; the final table in the sequence summarises the overall cost of each option (excluding future bridge maintenance costs). The tables indicate that scheme costs are expected to range from £88m (Astmoor to West of Albright and Wilson) to £118m-£123m for Central Expressway to East of Albright & Wilson (without and with terminal junction grade separation). (The cost of duplicating the existing bridge is estimated at £50m). Note – these costs include the cost of the Do Minimum scheme, estimated at £6.7m)

14.23 These scheme cost estimates have been included in the AST.
14.24 In order to determine the value for money which the new crossing would represent, the Present Value of Cost (PVC) of each option has been determined, and compared with the Present Value of Benefits (PVB). To produce the PVC we have estimated the level of expenditure which might fall in each year. The analysis is set out in Table 14.13. We have assumed that the main construction period would be 2008 to 2010, with a third of the land and construction costs falling in each of those years. We have spread the design, preparation, and supervision costs evenly from the year 2001 to the opening of the scheme in 2010, and we have assumed that additional bridge maintenance costs, evened out at £770,000 per year, would be incurred annually from 2011 onwards. As with the scheme benefits, the scheme costs over the years up to 2040 have been expressed in 1994 prices (using the Retail Price Index modified by the Road Construction Price Index) and discounted from the year in which they are incurred back to the current year.

14.25 The values in Table 14.13 (which have been transferred to the AST) indicate that the PVC for the various eastern scheme options ranges from £52m (Astmoor to West of Albright & Wilson) to £69m-£72m (Central Expressway to East of Albright & Wilson). (The PVC of the duplication option is about £28m).

14.26 In the AST, the values of costs (PVC) and benefits (PVB) are compared to produce a Net Present Value (NPV) for each scheme, and also a benefit to cost ratio. These values are regarded as the key economic performance indicators for transport infrastructure schemes. The NPV of options which pass West of Albright and Wilson falls in the £18m to £26m range, whilst the East of Albright and Wilson options range from £40m to £60m. The duplication scheme has an NPV of about £50m. The ratios of benefits to costs as shown in the AST indicates that the benefits of the various west of Albright and Wilson schemes exceed their costs by between 27% and 48%, with the East of Albright & Wilson benefits exceeding costs by 59% to 83%. The benefits of the duplication scheme exceed its costs by over 170%.

14.27 The analysis indicates that all the schemes considered would represent very good value for money, and the schemes would compare favourable against schemes elsewhere in the country. There is a very strong argument in favour of a new crossing in transport economics terms.

14.28 The most expensive schemes produce the greatest benefits in terms of journey times and vehicle operating costs. Setting aside the actual funding required to implement the proposal, Option 5A (Central Expressway to East of Albright & Wilson) produces the greatest overall scheme value (NPV of around £60m). The variant of this scheme which excludes grade separation, Option 5, (which could be seen as a first part of a phased implementation of scheme 5A) provides slightly less overall value (NPV about £40m), similar to the other East of Albright and Wilson scheme (Option 3, which starts at Astmoor West). Schemes terminating west of Albright & Wilson, whilst performing well, nevertheless produce less overall value. The overall value provided by the duplication scheme (Option 6) falls between the two best eastern crossings at about £50m NPV.
PROCUREMENT AND FUNDING POSSIBILITIES

Introduction

14.29 The procurement and financing of highway infrastructure can be undertaken in three basic forms, Public Procurement, Private Finance Initiatives (PFI) and Public Private Partnerships (PPP). In the UK procurement has embraced all three of these initiatives at different times and we are now in the situation that we are well placed to define which is best for each individual situation. It is possible that the new Mersey crossing could be procured under any of these three initiatives and it is our aim in this chapter to provide guidance as to which may be the most appropriate.

14.30 The remainder of this section will therefore outline some of the advantages and disadvantages of each of the approaches available for the design, construction, operation and maintenance of the new crossing.

Public Procurement

14.31 Given that this is the traditional method of developing highway infrastructure within the UK we do not intend to dwell in the details of the process. However we feel it is important to highlight some of the key issues regarding the financing of such a major development through public means.

14.32 The major issue will, inevitably be centred around the Borough’s ability to raise the £90m to £120m or so capital funds required to build the bridge. Currently this would have to be undertaken through the Local Transport Plan procedure as the only available source of public funding to the Borough. Given the current, and foreseeable, availability of public funds it would seem unlikely that this level of funding would become available in the timescale envisaged. There is then the issue of maintenance of the bridge which though less than the cost of maintaining the existing bridge (as a different form of construction would be adopted), would nevertheless constitute a significant annual sum.

14.33 Whilst the scheme offers good value for money, as set out in the previous section, and there is thus a strong argument in favour of the principle of public funding of the new bridge, the size of the overall ‘cake’ available for publicly funded transport projects in the Region is such that it is unlikely that a sufficiently large ‘slice’ would be made available for one scheme within the near future.

14.34 Overall this public sector procurement avenue is unlikely to be feasible in the current public financial climate, if the second crossing is to be procured in an acceptable timescale.
Private Finance Initiative

14.35 The Private Finance Initiative that would be available for the development of the new crossing would primarily be based around a Build Operate Transfer (BOT) procurement procedure. This system is the simplest, in relative terms, of all PFI initiatives. This adoption of a BOT approach would involve the letting of a concession, following competitive tender, to a company, or more commonly a consortium of companies to design, construct, operate and maintain the new crossing for a fixed period of time.

14.36 Under this type of system all capital funding would be found from the private sector, normally through investment banks and there would be no requirement for public finance of any form. The concessionaire would be granted the ability to collect direct tolls from the users of the crossing that would be set at a level to repay debts incurred in borrowing the necessary funds to construct the crossing. Normally this debt is anticipated to be paid back, with all interests to the lenders within 7-10 years of opening. The term of a concession of this type will then depend upon the anticipated annual revenue that can be expected to ensure coverage of the debt repayment, the annual operation and maintenance of the crossing and, as would only be expected, the profit margin expectancy of the consortium. This term can vary from as little as 5 years (Queen Elizabeth II Bridge at Dartford) to 50 years (Birmingham Northern Relief Road).

14.37 While this approach has the great advantage of not involving any public finance it is not without its drawbacks. Firstly the Concession Company will want to have the ability to set its tolls at a ‘commercial’ level. This means that any discounts for Halton residents and employees would have to be funded from the tolls levied on all other users. It is possible that these tolls may be too high to retain the potential market for the crossing and potential users will transfer to other crossings, even if it means a much longer journey. There is some evidence of this happening when the tolls were increased considerably on the Seven Crossing for example.

14.38 The final element which is of potential risk on behalf of the Borough is the hand back arrangements. Within a concession contract this is an important issue to ensure that the crossing is in a good state of repair when it is taken back in the future. It may seem obvious that one way to avoid this issue would be to have an unlimited term concession contract and the responsibility for the Operation and Maintenance (O&M) of the crossing to be permanently with the Concession Company. While this may, on the surface, seem attractive, it is not an approach that should be considered. Firstly the likely candidates for such a concession would, within our experience, prefer to have a limited term commitment. Secondly, once the crossing is handed back to the borough the revenue will still be accrued. This will provide the borough with a regular income, over and above the annual O&M costs, to enable it to supplement other transport requirements of the area. This is the current situation with the Dartford Crossing where the concession contract will end in 2001 and the DETR are currently investigating ways in which, under current legislation, they can reinvest the profit of approximately £40,000,000 per annum.
Public Private Partnership

14.39 The most obvious form of PPP currently in operation in the UK is the Design Build Finance Operate (DBFO) system providing design, construction and on-going maintenance services on sections of the trunk road and motorway network for the Highways Agency. Basically the DBFO system is a concession based approach with the necessary initial financing being provided by private investors and the revenue payments coming from government in the form of either shadow tolls, availability payments or a combination of the two.

14.40 Other forms of PPP that have been implemented throughout Europe involve differing levels of involvement from both sides but all revolve around all or the vast majority of the initial capital investment being secured through private investment.

14.41 The PPP approach is currently the most favoured approach as it allows the massive financial investment needed for infrastructure development to be found outside the public sector but allows the public sector varying levels of involvement and control. If it is assumed that the new crossing, for instance, procured under a PPP arrangement where all the total capital investment required is found through private funds, then the concession company will need to collect direct tolls to service its debts. This is where the public sector involvement can make the overall package more attractive to itself and the users of the crossing. The involvement of the public sector could be through revenue guarantees on the tolls to allow lower 'social' tolling levels that would ensure keeping the potential market. It would be possible, for instance to introduce a form of shadow tolling payment mechanism from the Borough to the concession company that could be applied to Halton residents and employees to ensure they have discounted passage.

14.42 Another form of Public contribution to a PPP arrangement is the hand over of a current asset to the Concession Company that they will undertake the O&M for under tolled conditions to assist in either the capital investment for the new infrastructure or as a form of subsidy. In the situation with Halton there is the prime asset of the Jubilee Bridge that could be included in any concession agreement to be tolled with the understanding that revenue over and above the O&M costs for that bridge are used to subsidise the Halton resident and employee users of both bridges.

Viability

14.43 Given that the investigation of the means of funding the bridge proposal is at an early stage, we have carried out only a very simple analysis to gauge the general viability of a privately financed river crossing. In order to do this we have had to make an assessment of likely toll income, and of costs of operating and maintaining the two bridges. The implementation costs of tolling also have to be added to the base construction costs which we have estimated previously.
14.44 The combined flow using both bridges over the day as a whole would vary very little between the bridge options, so we have made a single assessment of toll income, irrespective of which option is under investigation. We have also assumed that some form of discount would be made available to Halton residents and employees, so that the bridge is not seen as increasing the severance between the two parts of the Borough. We have NOT assumed that the crossing would be made toll-free for Halton residents as this would be counter-productive to encouraging a shift towards public transport (we have assumed that no toll would be levied on buses on scheduled services).

14.45 We have considered two tolling scenarios – a low-toll scenario in which the standard toll for all vehicles would be £1, with an 80% discount for Halton residents and employees, and a 50% discount for Halton HGVs, and a higher-toll scenario in which cars pay £1.20, goods vehicles £1.80, with a 2/3 discount for Halton residents, employees, and HGVs. These scenarios predict a gross toll income of £15m to £21m in the opening year, rising to £17m to £25m per annum for 2025 onwards – and they have been used for illustrative purposes only – they do not represent either a recommended or predicted tolling level. Tables 14.14 and 14.15 summarise our assessment based on these two tolling scenarios for each of the bridge options. In each case additional capital expenditure over and above the basic scheme cost has been included to allow for the introduction of tolls and other works included the concession, and an allowance has been made for the ongoing cost of toll collection. In the case of Option 5A which includes grade separation of the terminal junctions, it has been assumed that that element of the scheme would be deferred to about 2019 to improve the cash flow. We have also assumed that tolling of the existing bridge would start in 2008, at the start of the main works on the new bridge.

14.46 The Tables make no allowance for inflation or toll increases and are based on very simplistic assumptions, so can be used only as an initial guide on viability. The tables highlight the year in which the concessionaire’s debts could be paid off (balance turns positive), and a second year, which could be the year of hand-back to the public sector, has also been highlighted. The tables show the relative performance of each scheme, but they also highlight the sensitivity of the outcome to relatively small changes in assumed toll levels. Overall, however, they do confirm that there is likely to be private sector interest in the proposal.
Conclusions

14.47 It is obvious from our report that there is a proven need for a second crossing of the river Mersey within the Borough of Halton. The estimated cost of this crossing is approximately £90m to £120m which would be very difficult to finance through normal Local Authority means (LTP) and therefore must be financed via another medium. Our experience of the financial market at the moment in the UK suggests there is a great lack of such projects on the market and hence the financial institutions are currently bidding fiercely for any such projects to take forward. The same can be said for the likely concession consortia that would be interested in such a project. The DBFO market is fully satisfied and the Maintenance and Improvement Agency market is also fully satisfied meaning the major contractors in the UK are looking further afield for their future markets.

14.48 We are also aware of the further initiatives the Highways Agency are investigating with the current concessionaires new methods of private finance revenue generation in the DBFO and M&IA operations to reduce government investment needs.

14.49 Given these issues we would recommend that Halton Borough Council, probably in collaboration with the other Local Authorities in the area, commence the development of a Private Public Partnership Concession process for the design, construction, operation and maintenance of the new Mersey Bridge. This concession to include the hand over of the Jubilee bridge to the successful Concession Company for them to instigate tolling probably upon start of construction of the new bridge. The concession agreement to include a discounted cost system for all Halton residents and possibly employees to be installed on both bridges. Finally for the concession to have a finite life of probably 20-25 years with stringent hand back conditions regarding the structural integrity of both bridges.
15. ASSESSMENT OF ACCESSIBILITY AND INTEGRATION ISSUES

PUBLIC TRANSPORT ASSESSMENT

15.1 All the eastern scheme options under consideration include extensive bus priority measures in the terminal junctions, between the northern terminal junction and Lugsdale Road via the Fiddlers Ferry Road junction, and a new connection to the busway at Castlefields Avenue East. Effectively, these measures will connect the Runcorn busway to Widnes, allowing buses from Halton Lea and East Runcorn to gain more direct access to the new bridge and locations on the north bank of the river. West of Albright & Wilson options include the possibility of a new busway link being provided through the former ICI works to Waterloo Road (though for most journeys the Waterloo Road area can be accessed as easily via the Silver Jubilee Bridge).

15.2 The Astmoor schemes provide a less direct route for buses between Halton Lea and Widnes Centre than would the Central expressway crossing location; however, car users are similarly disadvantaged. The Astmoor connection may provide a more direct route from Runcorn Town to Widnes Centre than would a Central Expressway connection but, again, the existing bridge is likely to remain the preferred route cross-river for services calling at Runcorn High Street (and direct services to Widnes centre could be provided now by using the Widnes eastern By-pass exit from the bridge, rather than travelling via Waterloo Road and Victoria Square).

15.3 Overall, all the eastern options make it possible to make enhanced public transport routings available through the linking of Widnes to the Runcorn busway, and there are no significant differences between the schemes.

WALKING AND CYCLING ASSESSMENT

15.4 Similarly, all the options developed provide connections to the full list of potential walking and cycling generators previously identified. Clearly, the westerly alignments provide more direct access to Spike Island on the north bank and Runcorn Centre on the south bank, whereas the more easterly alignments give better access to Wigg Island and the east end of Astmoor Industrial estate. As with public transport impacts, there are marginal differences between the options in the context of walking and cycling, but these are not significant – all eastern options can provide improved accessibility on foot and by cycle.
PLANNING AND ECONOMIC DEVELOPMENT ASSESSMENT

Introduction

15.5 The section which follows identifies existing land uses at either end of the alternative alignments for the second crossing. In addition it considers uses close to the existing crossing and in all cases, the impact on land uses of building a new crossing in the particular location is assessed.

Astmoor

15.6 The Astmoor Industrial Estate lies between the Bridgewater & Daresbury Expressways and the Manchester Ship Canal. It was established as part of the New Town and has undergone a period of mixed fortunes. There are several signs of recent investment, with improvements to existing premises, new factories and units under construction and recently developed office park premises. The estate is well served by the existing road network, from two junctions on the expressway, and the overall standard of the environment is high. The estate is also served by the Runcorn Busway and is very accessible from all parts of the town. Within the estate there exist a number of tracts of vacant land with development potential, particularly at the western end.

15.7 North of the Ship Canal, Wigg Island comprises an area of partially reclaimed land which was formerly used for tipping. Some tipping of chemical wastes occurred in this area. There have been proposals to provide additional tree planting on Wigg Island as part of the Mersey Forest and to create new areas for public recreation, including sports pitches and motorcycle scrambling. To the north of Wigg Island, lie the Astmoor Salt Marshes.

Potential impact

15.8 The implementation of the Central Expressway option would require the demolition of probably 10 industrial/commercial premises and the relocation of 14 existing firms. Businesses in the area would be unlikely to benefit significantly from the new road as they already enjoy good access from the Central Expressway. Construction activity could lead to short term disruption at the centre of the industrial estate which could have a moderate adverse impact on the operation of businesses. The main advantage of the new road would be that it would facilitate access to the employment opportunities available on the estate for residents of Widnes. This would similarly apply to the western alternative. In this case, fewer properties/firms would be directly affected (one large building which incorporates 8 business units), but accessibility to the area could be disrupted for a significant period, and construction would temporarily close the Astmoor West junction.
15.9 Either option could allow for longer term access to Wigg Island, though the height of the new road above the Ship Canal would necessitate extensive structures to accommodate junctions and access roads. The easterly alternative would be preferable in view of land availability and proximity to those parts of the island which arguably have most development potential.

Widnes

15.10 The north bank of the Mersey is flanked by the marshes of Widnes Warth and, at the western end by the Spike Island Recreation Area and the settlement of West Bank. North of the St Helens Canal, industrial uses predominate, though there are also significant tracts of vacant, former industrial land. At the western end, much of the former ICI plant is unoccupied, the site being accessed from Waterloo Road. Adjacent to this is the Albright and Wilson chemical plant. To the east of this plant much of the land between the canal and Moss Bank Road lies vacant. The exceptions being the offices of contamination specialists Routedges at the end of Tan House Lane and the Saffil chemical plant. The whole of this land was formerly occupied by the chemical industry and is contaminated to varying degrees. At the eastern end adjacent to the boundary with the power station lies a disused waste tip.

15.11 North of the Albright and Wilson plant lies an area of serviced land adjacent to the Widnes Eastern By-pass. Those plots nearest to the by-pass are occupied by a Focus DIY store and Brewers Fayre pub/restaurant, the rest remain vacant. Dennis Road is flanked by industrial properties, mainly related to the chemicals sector. The area between Moss Bank Road and Fiddlers Ferry Road is also in industrial use and provides a base for firms in the chemicals sector and their distribution companies. Blue Circle Cement has a depot on Tanhouse Lane. There are plots of vacant and underused land within the area, including land with a frontage to Fiddlers Ferry Road. East of Gorsey Lane lie the chemical plants of Bush Boake Allen and Croda Colloids. The recent Mersey Valley Processing Centre (which incorporates a waste incinerator) is bounded to the north by the serviced Shell Green industrial development site where several large plots with good road access are available. This is being promoted for B1/B2/B8 development.

Potential impact

15.12 Neither of the alternatives would result in the loss of significant areas of land in productive use. The eastern alternative would affect an existing scrapyard to the east of the Albright and Wilson site and would sever an area of land proposed for development. Of greater significance would be the impact on the future use of the area on the north bank of the Mersey, which has been discussed previously.
Conclusion

15.13 Proposals for a second crossing would be in accordance with policies at regional and national level, particularly if linked with measures to improve public transport and create an integrated transport system serving both communities on the banks of the Mersey. The impact on existing industrial and commercial premises and on the self regenerating processes apparent in the Astmoor industrial estate, coupled with concerns about impacts on nature conservation and future recreation interests at Wigg Island, suggests that a western landfall for the new crossing would be preferred from a land-use planning perspective.

15.14 On the north bank however, the key issue is the extent to which the proposal could contribute to local regeneration initiatives and emerging strategies for development. It is concluded that the more easterly landfall would offer a more robust solution and one which would have the best chance of stimulating the redevelopment of extensive brownfield sites. However, as noted in the Economic section of this report, the construction of the crossing in itself is unlikely to provide the whole of the necessary stimulus. Other factors might include financial support for exceptional site development costs, greening initiatives or comprehensive development packages such as that proposed for Widnes Waterfront.

Existing crossing

15.15 For completeness and for comparison purposes, we have also considered land-uses in the vicinity of the existing bridge crossing (and the impact of duplicating the existing crossing).

15.16 On the south bank of the river, land between the road and railway viaducts is largely vacant, with the exception of a row of terraced houses and a church partly built into the railway viaduct on Ashridge Street. To the east of the road bridge, lies an area of Victorian terraced housing, some of which is in poor condition. These properties suffer from noise from traffic on the bridge which completely overshadows them. Access to the area is poor. The housing areas lie within the designated area of the SRB Round 2 “Runcorn on the Mersey” programme area. This aims to secure, inter alia, the revitalisation of the run down housing areas. Were it not for the bridge, this would be a potentially attractive location for housing, close to the town centre and a wide range of amenities.
15.17 On the north bank of the river lies the area of Widnes known as West Bank. This is an area of run down Victorian housing which is isolated from the rest of Widnes and is understood to suffer from high levels of deprivation. There are some local shops and a number of public houses, one of which is situated adjacent to the bridging point. Several properties lie close to the road which cuts through the area at a high level. These properties include a primary school and residential properties, some from the Victorian era and some dating from a period of renewal in the 1970s. All these properties suffer from proximity to the bridge and approach viaducts. The area between the road and rail bridges lies vacant and unkempt. West Bank also provides a home for the Catalyst museum of the chemical industry. This, together with the Spike Island recreation area and the Conservation Area at West Bank, means that the area has potential for regeneration, which must emphasise establishing new connections with the Widnes urban area.

Potential impact

15.18 Construction of a second road bridge close to the existing crossing would detract from existing regeneration initiatives. In the short term it would necessarily result in the demolition of a small number of residential properties, albeit older stock of generally poor quality. Environmental conditions for remaining properties would be likely to worsen slightly and, at least during the construction phase, the relative isolation of the Dukesfield residential area west of the bridges would increase. North of the river, similar but lesser effects would apply. An extensive period of construction would be likely to cause some disruption to the community at West Bank (affecting both its accessibility and environment) and delay measures to regenerate the area.

15.19 A new crossing close to the existing would not deliver the scale of accessibility improvements which would stimulate the development of industrial zones north or south of the river or help to achieve the regeneration of brownfield sites north of the river.
16. ASSESSMENT SUMMARY AND SCHEME RANKING

16.1 The purpose in carrying out the assessment was to determine whether schemes where technically and economically feasible, and the extent of any adverse impacts in general terms. The assessment is also intended to allow some form of ranking of schemes to be devised, so that a recommendation for a preferred scheme or schemes can be made.

16.2 The individual elements of the assessment have been set out in some detail in the earlier chapters. In this chapter we attempt to bring all the strands together and reach an overall conclusion. Extensive analysis has been involved in assessing the various bridge options so that we can make recommendations for the type of scheme to be taken forward.

16.3 The Assessment Summary Table (see Table 16.1) attempts to summarise all the important considerations for all the scheme options on a single page. In order to achieve this, a more abbreviated approach has been taken than is set out in the NATA guidance as, in the guidance, the sheet would summarise the assessment of just one option.

16.4 In many ways, it is easier to home in on a preferred option by comparing alternative elements of the schemes – such as the two northern terminations, and then the two southern terminations, and then consider other aspects.

Comparison of Northern Terminations (West and East of Albright & Wilson)

- Planning & Economic Development – The East option is preferred because it more directly serves the Tun House Lane industrial area, and it could skirt (and serve), rather than intruding into, the Widnes Warth reclamation/special development opportunity area.
- Impact on Property – The differences between the schemes are limited; the west options would have some small impacts on the western fringe of the Albright & Wilson site and/or the eastern end of the former ICI plant (now owned by St Modwen); the eastern option affects a scrap recycling operation south of the Garston-Warrington railway, and potential development plots at Bowers Business Park
- Traffic Attractiveness – The western option is expected to attract about 34,000 vehicles per day (vpd) away from the Silver Jubilee Bridge, while the East of Albright & Wilson alignment could attract 40,000 vpd
- Capital Cost – East of Albright & Wilson schemes cost about £8m more than more westerly schemes due to the additional rail crossing required, and slightly greater overall length
Traffic Economics - East of Albright & Wilson schemes provide an additional £20m of journey time savings and vehicle operating cost reductions compared with West of Albright & Wilson schemes.

16.5 Overall, our assessment is that there should be a preference for an East of Albright & Wilson alignment on the north bank.

Comparison of Southern Terminations

- Planning and Economic Development – there is a slight preference in favour of a Central Expressway termination, as this more central location gives more direct access to the Manor Park and Daresbury development areas.
- Impact on Property – the Astmoor West tie-in point is preferred on property impact grounds as it would affect one large property which includes 8 smaller units; the Central expressway option would require 10 properties, incorporating 14 business units.
- Traffic Attractiveness – the Central Expressway alignment is preferred, as the majority of traffic using the bridge will approach and depart via the Central Expressway; this tie-in point serves the main traffic demand directly, whereas an Astmoor West connection would introduce a ‘dog leg’ into the route to/from the Central expressway.
- Capital Cost – the Central Expressway option requires an additional outlay of about £22m when compared with the Astmoor West option, a proportion of which arises from increased land/property costs.
- Traffic Economics – the Central Expressway options provide an additional £11m time and operating cost benefits over the Astmoor schemes.
- Bus Improvements – the Central Expressway crossing can provide a more direct route for bus services between Halton Lea, surrounding residential areas and the development areas at Manor Park and Daresbury on the south side, to Widnes Town Centre and suburban areas on the north bank.

16.6 Overall, therefore, we have concluded that the Central Expressway option provides a better performance but there is a significant cost penalty involved.

16.7 In addition to assessing the differences between the schemes, our assessment has, of course, considered a wide range of issues, upon many of which all options have a similar impact, as set out below.

Ecological, River and Navigation Issues affecting all Options

16.8 Works to provide piers in the river, and the presence of those piers when the works are complete could have significant adverse impacts on a number of important issues –

- the Mersey Estuary SSSI and RAMSAR
- river and river bank ecology and contaminated land
- hydrology (river flow)
16.9 At this stage, there is not sufficient information available to determine whether one scheme is likely to have a materially different impact on these issues than other schemes. Whilst some scheme might have different numbers of piers in the river than others, the overall impact might not be significantly different.

16.10 From a structural engineering/cost viewpoint we have considered various forms of bridge construction and concluded that the most cost-effective form of construction would be a concrete box girder bridge with spans of approximately 100m. This would result in between 7 and 11 piers in the river, depending on which option is selected. Some of the potentially adverse impacts of the crossing might be reduced if there were no piers in the river (though the impact of potentially much larger piers on the river banks may also be significant). We have, therefore, given some consideration to the use of suspension or cable-stayed bridges, which could span the whole river. However, they would add at least £50m to £80m to the cost. The cable stayed option would fall at the lower end of this range, but it requires considerably taller towers than a suspension bridge, and would penetrate the protected airspace requirements of Liverpool Airport. A suspension bridge would cost more, but could be constructed below the safety zone. Our financial assessment does, however, indicate that these higher cost schemes would not be financially viable.

Air Quality and Noise Issues - affecting all options

16.11 Our assessment indicates that air quality in West Bank and the western part of Runcorn Town is poor, with levels of nitrogen dioxide and particulates exceeding air quality targets. By 2025, advances in vehicle design and firmer regulations will mean that the level of particulates will have fallen below the target values over the whole area. All parts of West Bank and Runcorn will have improved nitrogen dioxide levels through technological improvement by 2025, but some areas will remain above the target levels. Whilst congestion will be removed, the reductions in traffic flow, irrespective of which eastern option is pursued are such that the impact of any of the eastern scheme options on air quality will be small, and will not materially change the air quality regime in the areas.

16.12 Traffic noise levels will gradually increase without a scheme in place. However, the impact of all the eastern crossings will be negligible – the scale of traffic flow reduction is not sufficient to cause a material change in noise levels, and any reduction in flow is offset by an increase in traffic speed. The schemes will not bring about the 3dB reduction (the recognised threshold for a significant improvement) at any location.

Funding Mechanisms

16.13 We have examined how a new crossing scheme could be funded. We have considered conventional public funding through the Local Transport Plan process, and also a range of partial or full private sector involvement.
16.14 Our estimate of the cost of procuring a new crossing (including construction, land, and preparation costs) varies from £90m (Astmoor to West of Albright & Wilson) to £123m (Central Expressway to East of Albright & Wilson with grade-separated junctions). The various scheme options do represent good value for money, and there is a strong argument for pressing for public funding to be made available for the project; the scheme should be given a high profile in this year’s LTP documents. However, we have concluded that funding through the LTP process is unlikely – only because the size of the overall public sector ‘cake’ likely to be available for transport infrastructure is too small for such a large ‘slice’ to be allocated to one project.

16.15 In any event, government is likely to require an analysis of the scheme’s suitability for private sector involvement. We have concluded that a Private Finance Initiative (PFI) or Public Private Partnership arrangement (PPP) would be a real possibility for a new crossing. However, the private sector consortium would need to recoup its outlay through the collection of tolls. Clearly, the tolls would need to be applied to both the Silver Jubilee Bridge and the new crossing if any significant income is to be generated.

16.16 We would envisage an arrangement whereby the existing bridge (and its maintenance commitments) would be handed over to a consortium which would undertake to build a second crossing (and possibly other socially important infrastructure), maintain the second crossing, operate both bridges and, after an agreed period of time, would hand the infrastructure back to the local authority. At that point, the consortium would have repaid its loans to the banks, and would have made its profits on the venture. The local authority would receive back the bridges in good condition and, although the maintenance liability would return to the Council, so would the toll revenue, which could be used to fund other transport infrastructure.

16.17 We estimate (on a very preliminary basis) that the long term net income from the bridges could amount to £8m to £16m per annum, and that the private sector would need to be given a concession period extending to somewhere between 2023 and 2038, depending on the value of a number of assumptions.

**Overall Assessment**

16.18 The overall conclusions of our assessment of potential eastern crossings of the river are that -

- Both bridges in combination can act as an integrated package to provide good facilities and a good level of service for general traffic, bus passengers, pedestrians and cyclists
- Eastern Crossings performs well in terms of -
  - Traffic performance
  - Improved Public Transport facilities
  - Cycling and Walking Linkages
Economic Development/Regeneration aims

- Eastern Crossings performs poorly in terms of -
  - potential environmental impacts in the River and on the River banks
  - impact on air quality and noise (where their impact is limited)

Scheme Preference

16.19 Of the wide range of eastern crossings which we have considered, we conclude that -

- The best performance is provided by Central Expressway to East of Albright & Wilson crossing, but it also has the highest cost (£118 to £123m) and most impact on property

- The Astmoor to East of Albright & Wilson scheme performs slightly less well, but costs £20m less (and has potentially less impact on Wigg Island)

- Both options should be fundable via PFI or PPP routes

- Further studies are required on ground conditions, environmental issues, hydrology, and funding

Comparison with Previous Studies

16.20 The most recent river crossing study recommended that additional capacity be provided at Runcorn Gap (by effectively duplicating the existing bridge). In view of that recommendation, and to provide a complete assessment of the situation, we have compared the eastern schemes which we have developed in the course of this study with an alternative concept of providing additional capacity at Runcorn Gap. We have assumed that the duplication option would include the provision of a four lane northbound bridge (together with new facilities for pedestrians and cyclists), located between the Silver Jubilee Bridge and the Railway Bridge. The bridge would take the form of a concrete box girder bridge with piers adjacent to the railway bridge piers. The existing bridge would provide for southbound traffic, and some enhancements to bus priorities would be provided in both directions, together with alterations to the approach roads on the south side.

16.21 The existing road and rail crossings at Runcorn Gap utilise the section of river with the narrowest crossing distance. The ground conditions in the vicinity of these bridges are known to include sandstone at a reasonably high level, therefore (from an engineering perspective) the site lends itself to being used for crossing purposes. There is a gap between the two structures which could be utilised for a further crossing, although construction methods would be limited by the close proximity of the two adjacent structures.

16.22 Our comparative assessment is set out below.
Planning & Economic Development Issues:

- both scheme types offer congestion relief; the eastern option may open up more land, and is better located to serve Manor Park and Daresbury development areas on south bank, and SE Widnes on north bank

Environmental Impact:

- Ecology – there would be a much reduced impact with a Runcorn Gap crossing as the river bank SBIs should be unaffected
- Pollution – there would be reduced silt disturbance with a Runcorn Gap crossing – as the rock head is closer to the surface, and the faster river flow means that there is less silt present, and there would be far fewer piers in the river
- Hydrology/Navigation - river flow impact is minimised with a Runcorn Gap scheme as the piers would be in line (and immediately adjacent to) those of the railway bridge, and navigation rights would be unaffected as the scheme would need to be at the height of the current bridge to tie in to the approach roads (this should allow a bridge to be provided earlier by avoiding the Parliamentary procedures needed to extinguish navigation rights and, potentially, the time required for hydrological modelling)
- Noise/Air Quality – the noise impact of a Runcorn Gap scheme is virtually identical to that of an eastern crossing; an eastern scheme would have a marginally better air quality impact than duplicating the current bridge.
- Traffic Economics – A Central (Runcorn Gap) crossing would produce £78m time & operating cost benefits compared with £98m to £131m with eastern options
- Public Transport – It would be more difficult to achieve as great an improvement for public transport with a Central (Runcorn Gap) crossing
- Walking and Cycling – there is more scope for improving links from West Bank to Runcorn with a Runcorn Gap crossing; an eastern crossing offers much more scope for leisure trips
- Impact on Land – The Central Runcorn Gap crossing would require 20 residential properties, the eastern crossings demolish 8 to 14 industrial units
- Construction, Land, Fees costs – We estimate the overall cost of providing a duplicate crossing at Runcorn Gap at £50m, compared with an Eastern crossing cost estimate of £90m to £123m
- Financial Viability – From a financial viewpoint, a Runcorn Gap crossing would be of much greater interest to the private sector (as toll income would be similar for all options, but capital outlay and ecological/river issues are likely to be less onerous for a Runcorn Gap solution). Hand-back to Local authority of a PFI scheme might take place between 2018 and 2024 for a Runcorn Gap scheme compared with 2023 to 2038 for an eastern scheme, providing the local authority with an income stream much earlier.
Conclusions

16.23 The main conclusions of our study are that eastern crossings -

- are technically feasible and provide good value for money
- have costs which fall within a viable PFI funding range
- perform well in terms of traffic operation and economic development aims
- but have potentially serious adverse environmental impacts

and that

- a robust case for public funding of a scheme can be included in this year's LTPs
- as an absolute minimum, and given the scheme's value to a range of local authorities, LTP funding should be made available for future stages of the feasibility and development work
- the Central Expressway to East of Albright & Wilson option is the best performing but most expensive option
- A firm preference cannot be finally confirmed prior to more detailed surveys being carried out, the most critical of which are:
  - Geotechnical/contamination surveys to determine the location and strength of the rock-head on various alignments and the nature of (and contamination potential of) overlying material, both within the river and on the banks
  - Computer-based and physical modelling of the river hydrology to determine the impact on the river flow regime of various crossing locations and construction forms, so as to assess the acceptability and scope for mitigation on river flow/dredging and ecological issues, thus
  - Alternative schemes – particularly Astmoor West to East of Albright & Wilson, and the Central Crossing at Runcorn Gap - should not be ruled out at this stage.
17. **RECOMMENDED SCHEME**

**Location**

17.1 Our recommended scheme links the Central Expressway at its junction with the Bridgewater and Daresbury expressways on the Runcorn bank of the river with the Widnes Eastern By-pass south of its junction with Fiddlers Ferry Road.

**Description**

17.2 The scheme producing the best overall performance includes grade separation of the terminal junctions, such that traffic to and from the Central Expressway in Runcorn would be located on a third (high) level with the Bridgewater-Daresbury Expressway through traffic passing east-west at the lowest level, and a roundabout linking the routes located at an intermediate level. On the north bank the grade separation would involve a flyover linking the new bridge with the Widnes Eastern By-pass north of the Fiddlers Ferry Road junction. The ground level junctions would cater for all other traffic movements.

17.3 Given the overall cost of the full scheme (estimated at £123m), it is likely that the grade separation, particularly at the southern end, would be added as a later phase of the scheme, with the initial junctions designed to accommodate grade separation later with minimal abortive works. (Clearly, if the scheme is privately funded and financed by tolls, the concessionnaire would not wish to build the scheme in such a way that major disruption occurred when a later phase of works is implemented).

17.4 The elements of the scheme are described in chapter 10 (see Options 5 and 5A, paragraphs 10.37-10.39). The basic scheme (Option 5) is shown in Figure 17.1 appended to Volume 3, and the terminal junctions are shown in more detail in Figures 10.8 and 10.9.

17.5 The scheme, in conjunction with the existing Silver Jubilee Bridge, is intended to form an integrated package for dealing with public transport, walking, cycling, and general traffic movements across the river. As routing to either bridge is easier on the south bank of the river (because of the expressway system), it is likely that the bridge chosen by drivers will be more influenced by the location of the northern end of the trip, rather than the southern end. The overall impact of this will be that the majority of sub-Regional traffic will be found on the Silver Jubilee Bridge, and the majority of local traffic on the new crossing, though this will be achieved through free choice rather than enforced separation. (Traffic flows predicted to use each bridge in the morning peak in 2010 is shown on plots of the SATURN network in Figures 17.2 and 17.3).
Variable Message Signing

17.6 The general scale of the bridge and layout of terminal junctions have been devised to suit expected ‘normal’ traffic conditions. However, there will inevitably be occasional incidents on each bridge, and there may also be a need to close one or other bridge for planned maintenance activities. Clearly, one bridge alone will not have sufficient capacity to accommodate all the future traffic, nevertheless, the presence of two bridges makes it possible and prudent to plan for incidents. Whilst we have not considered the matter in detail, it would be sensible for the bridge scheme to include a variable message signing scheme, possibly automated, or semi-automated, so that drivers can be given advanced warning of planned maintenance (or information that a major incident has occurred) sufficiently distant from the crossing points to enable them to select the ‘other’ crossing (or abort the journey, or divert away from the area).

17.7 As it would be relatively difficult to direct large volumes of diverting traffic through the Ditton Road and Lower House Lane roundabouts without enhancement to the junction complex, the variable message signing scheme would need to include more advance warning than just on A562 to the west of Ditton Road roundabout. A system could be devised to intercept traffic on A562 to the west of A5300, on M62 and M57 to the west and north of Tarbock Interchange, and on A570 and M62 north and east of Rainhill Stoops, as well as more locally.

17.8 On the south bank, signing could be located on M56 west of J12 and east of J11, on the Rocksavage Expressway, and on the Whitehouse Expressway as well as more locally to the bridge.

Toll Collection

17.9 As discussed earlier in the report, it is likely that the bridge would need to be funded through tolling. In order to ensure that the second crossing was effective in relieving the Silver Jubilee Bridge, both bridges would need to be tolled. Indeed, one of the attractions of the project to the private sector would be the possibility of collecting tolls on the existing bridge as soon as work started on the new bridge, thus providing an income stream in advance of completion of the new crossing, and reducing the overall financial exposure.

17.10 Tolling technology has moved on considerably in the last few years. With congestion charging under serious consideration in London and some other large cities (quite apart from developments in Continental Europe and elsewhere) we can expect significant further advances in technology within the next few years. By the time tolls would be introduced on the Silver Jubilee bridge, the technology for electronic toll collection will be well established. This will mean that an increasing proportion of tolls will be collected ‘automatically’ – smart cards, other electronic devices, or even transponders built into new vehicles will be detected by roadside or overhead equipment, with vehicles travelling at normal speeds.
17.11 A lane of traffic can carry 1800 to 2000 vehicles per hour in good conditions. A quality exact-cash toll booth (such as in use in the Mersey Road Tunnels) can process vehicles at about 7 second intervals (500 vehicles per hour). In the absence of automatic collection, therefore, each lane on the bridges would need four toll booths if the booths themselves are not to limit the capacity of the bridge, quite apart from facilities for manual (non-exact-cash) payment. This would require extensive toll plazas which would be visually intrusive on the new crossing and on the Silver Jubilee bridge there may be difficulty accommodating them at all.

17.12 We have concluded that by 2010 electronic toll collection will be available to a sufficiently large proportion of traffic to limit the number of toll booths to one per lane, together with electronic tolling on each lane. It may be possible to collect (double) tolls in one direction and allow free travel in the other (as is carried out on the Severn Crossing). This may cause some distortion in route choice, but would reduce the tolling infrastructure required and tolling land requirements. For the moment we assume that tolls would be collected in both directions, but this is a matter to which further consideration can be given at a later date.

17.13 We have concluded that there is insufficient space to collect tolls on the Silver Jubilee Bridge on the Runcorn Bank (either northbound or southbound). We thus envisage that toll collection on the Silver Jubilee Bridge would take place on the north bank. Similarly, there is insufficient space to collect tolls between the A533/A557 merge/diverge on the north bank and the bridge itself; the two approaches would thus need to have separate toll collection areas. On the A533 approach/exit it should be possible to modify the DeSoto Road interchange converting it into a toll area with only small extensions to the highway boundary.

17.14 As regards the A557 approach, some widening would be required to provide the necessary width. In order to avoid mixing of bridge and non-bridge traffic in the toll area, it will probably be necessary to prevent general traffic leaving the A557 via the exit to Hutchinson Street; this exit would become buses only, with general traffic using the DeSoto Road exit from the A533.

17.15 For the new bridge, depending on the environmental/ecological impact, the toll area could be located on either bank of the river - on Wigg Island, or Widnes Warth - or (probably at greater cost) actually over the river itself. The new bridge toll areas would provide (in each direction) two automatic collection lanes, two manned/cash lanes with booths, and a controlled by-pass lane for buses, necessitating a widening of about 18m for each direction over a sufficient length to ensure that traffic queuing for the cash/manned booths did not interfere with automatic lanes or the bus lane.
SECTION D – THE NEXT STAGES

18. THE NEXT STAGES - OVERVIEW

18.1 Clearly, the provision of a new crossing across the Mersey at Halton is a major project. It will involve the expenditure of more than £100m, probably provided largely by the private sector, which will receive a return on its investment through income raised from tolls. The crossing sets a number of significant design challenges as well as raising a number of potentially major ecological, navigation and estuary hydrological issues.

18.2 The procedures for implementing a project of this size and nature are complex. If the new crossing is to be brought into operation within a reasonably rapid time frame many of the streams of procedural activity will need to be undertaken in tandem. We have estimated that it could be possible to open a new crossing to traffic in 2010. It has to be admitted that this is an optimistic though achievable target, but it will require a concerted effort in order to achieve this programme.

18.3 A large number of regulatory (or similar) authorities and government departments and agencies will be involved, quite apart from private sector investment, backing, and scheme development and implementation organisations. Procedures under various Acts of Parliament will need to be undertaken, and there will be a wide-ranging public examination of the proposals.

18.4 We are not in a position to detail all of these items at the present time – indeed, we would advise that further work should now be commissioned, following discussions with the Government Office for the North West, to investigate more specifically the potential routes by which a new crossing would be procured, and the consequent procedures and timescales involved.

18.5 In general terms, we see the overall timetable to achieve a 2010 opening following this general outline –

2001 Carry out Essential Survey Work to confirm feasibility of recommended scheme(s) – see next Chapter

2001 to 2003 Carry out further design and exploratory work to develop scheme to a stage where more accurate costings are achieved; identify most appropriate funding and procedural route.

2003 & 2004 Develop proposals, including wide consultation, in preparation for public inquiry; finalise funding mechanism

2005 Public Inquiry into proposals
2006 Complete various statutory procedures, carry out full detail design

2007 Advance works (possibly including tolling works for Silver Jubilee Bridge)

2008 to 2010 Main construction work

18.6 In the next Chapter we set out the most important areas of study and survey work that will need to be set in train at an early date. The whole range of design, ground conditions, and ecological and environmental studies will need to be completed before the scheme could proceed to public inquiry. However, clarification of the ground conditions and hydrological issues is fundamental and will need to be resolved before the absolute deliverability of the scheme (and thus the actual form of the scheme) can be determined. The private sector will not wish to become involved prior to the largest of the unknown issues being resolved, thus it may be necessary for these initial studies to be funded from the public sector, even if later stage of scheme development have a private funding element.

18.7 Generally speaking, the DETR does not provide grant assistance towards major schemes promoted through the TPP/LTP system until the year in which works are expected to commence. However, given the scale of this project, and its importance at a Regional level, we think that there is a strong case for the government to provide assistance with the next stages of scheme development, and that this point should be made with some vigour in this summer's LTP submissions.
19. IDENTIFICATION OF FURTHER STUDIES REQUIRED

19.1 This Chapter sets out our recommendations for further work on ground investigation, hydrological, and environmental issues. As indicated above, further work on funding and procedural issues will also be necessary.

Ground Investigation and Hydrological Surveys

19.2 Two of the key issues to be addressed when assessing potential options for the crossing and in determining a preferred option for submission through the planning process and for presentation at a public enquiry are bridge foundations and environmental impacts on the estuary.

19.3 The bridge configuration and cost will be dependent on the location and depth of suitable foundation strata for the piers. A ground investigation within the estuary will be required to provide the data needed for preliminary pier design and for establishing an economic relationship between the length of bridge span and the number of piers.

19.4 There will be environmental impacts on the saltmarsh, mudflats and sand banks in the estuary either directly effected by the footprint of the bridge crossing or indirectly through changes in the river morphology as a result of the construction of the crossing. A programme of hydraulic modelling will be required to assess the likely morphological changes and the resulting impacts on the estuary.

19.5 The geology underlying the estuary and the morphology of the river are closely inter-related. The ground investigation and the hydraulic modelling are inter-linked as discussed below and, therefore, should be undertaken as a co-ordinated programme of studies, as illustrated in Figure 19.1.

19.6 Data collection and survey work will be needed both to assist in the planning of the ground investigation and to provide the base data for the hydraulic modelling. This will involve the use of boats and/or amphibious vessels within the estuary and some of the data obtained will be used in both topic studies.

19.7 Possible alignments and configurations of the bridge for testing in the hydraulic modelling programme will be dependent on the findings of the ground investigation.

19.8 Some preliminary bridge design work will be needed to establish the length of spans and the number, location and size of piers. This will lead to the development of alternative configurations for use in the hydraulic modelling.

19.9 Similarly, a preliminary assessment of probable pier and bridge construction methods will be needed to allow the construction phase impacts to be modelled.
19.10 Because of the fixed costs involved in mobilising vessels and equipment within the estuary and in setting up the hydraulic modelling programme, it would be cost effective to undertake all the studies needed to develop the project up to the planning submission stage as one programme and the following budget estimates are based on this assumption. The scope and cost of the later studies would be subject to variation depending on the findings of the earlier studies.

<table>
<thead>
<tr>
<th>Study Type</th>
<th>Budget Estimate</th>
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<tbody>
<tr>
<td>Geotechnical Desk Study</td>
<td>£30,000</td>
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<tr>
<td>Geomorphological Desk Study</td>
<td>£10,000</td>
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<tr>
<td>• Assess geomorphology of upper/middle estuary</td>
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<tr>
<td>• Historical changes to channels and sandbanks</td>
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<tr>
<td>• Input to choice of alignments</td>
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<tr>
<td>Surveys and Fieldwork</td>
<td>£50,000</td>
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<tr>
<td>• Using boat, amphibian and terrestrial methods.</td>
<td></td>
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<tr>
<td>• Topographic and bathymetric surveys</td>
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<tr>
<td>• Geophysical investigations to determine soft bed/hard bed interface and surface profile of bedrock</td>
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<tr>
<td>• Sediment sampling</td>
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<tr>
<td>Geotechnical Investigation</td>
<td>£500,000</td>
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<tr>
<td>• Using a jack-up rig and amphibious plant</td>
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<tr>
<td>• Boreholes to establish ground conditions and to assist the interpretation of the geophysical investigation results.</td>
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<tr>
<td>• In-situ testing</td>
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<tr>
<td>• Sampling and coring</td>
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<tr>
<td>• Laboratory testing of samples for physical properties and contamination</td>
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<tr>
<td>Preliminary Bridge Design Assessment</td>
<td>£20,000</td>
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<tr>
<td>• Pier depth and size</td>
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<td>• Bridge span length/pier spacing</td>
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<tr>
<td>• Bridge configuration and pier location</td>
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<tr>
<td>• Alignment options for modelling</td>
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<tr>
<td>• Configuration options for modelling</td>
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<tr>
<td>Preliminary Construction Assessment</td>
<td>£100,000</td>
</tr>
<tr>
<td>• Appraisal of appropriate construction techniques</td>
<td></td>
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<tr>
<td>• Construction method options for modelling</td>
<td></td>
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<tr>
<td>Hydraulic Modelling</td>
<td>£450,000 to £900,000*</td>
</tr>
<tr>
<td>• Computational models for hydraulics (water levels and velocities), sedimentation and water quality</td>
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<tr>
<td>• Model runs to assess conditions of no bridge, alternative alignments and configurations and the construction phase</td>
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- Physical modelling for areas of turbulence and local scour effects, for example in the vicinity of piers.
- Assessment of impacts on estuarine regime
- Scope to be determined on basis of findings of earlier studies;

Cost* will depend on scope of modelling and number of runs required.

19.11 The total cost of these surveys is thus in the £1m to £1.6m range. The scale of the hydraulic modelling will clearly be dependent on the results of the earlier parts of the analysis.

Ecology and Nature Conservation

19.12 Further investigations and assessment work will be required to address all ecological issues including specific species field surveys, but more importantly the EIA process and production of an Environmental Statement for the scheme.

19.13 Whilst these element of the survey work are undoubtedly important, they are not expected to be critical to confirming the viability of the project. They will be influential in determining the form of crossing at a more detailed level and the extent and nature of mitigation measures required. They do not, therefore, need to be put in hand prior to outcome of the ground condition and hydrological surveys described in the previous section.

19.14 The Town and Country Planning (Environmental Impact Assessment)(England and Wales) Regulations came into force on the 14 March 1999. These regulations apply to all EIA applications received by a local planning authority. The local planning authority or Secretary of State shall not grant planning permission to such an application unless they have taken all the environmental information into consideration and they shall state in their decision that they have done so.

19.15 All Schedule I developments require an Environmental Statement to support a planning application. An individual determination on whether EIA is required must be made in respect of every project in Annex II to the Directive (Schedule 2 to these Regulations) which exceeds thresholds established by a Member State. Advice on the content of an environmental statement must be given to the developer who requests it before submitting an application.

19.16 The Habitats Regulations 1994 require that any activity that could significantly affect a site of European interest (ie a Special Protection Area, Special Area of Conservation or a Ramsar site) will require an appropriate assessment. Under section 48 an appropriate assessment is required to enable the competent authority to make a decision as to whether to grant planning permission for the activity or not. The Regulations restrict the granting of planning permissions for development which is likely to significantly affect an SPA or SAC, and one that is not directly connected with or necessary to the management of the site. The scope and content of an appropriate assessment will be decided upon by English Nature and will be dependent upon the size, location and significance of the proposals. It is likely that English Nature will require an appropriate assessment as part of any Environmental Statement in support of the scheme.
19.17 Specific field surveys that may be required include:

- comprehensive bird surveys to determine whether the integrity of the SPA, RAMSAR site and SSSI is likely to be affected;
- detailed botanical surveys (National Vegetation Classification) of the marshes that will be directly or indirectly affected by the proposals;
- fluvial geomorphological surveys;
- Benthic invertebrate surveys;
- Fisheries survey.