Safe roads, reliable journeys, informed travellers

Post Opening Project Evaluation

A5117/ A550 Deeside Park Junctions Improvement

Five Years After Study

February 2015

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Executive Summary

A5117 / A550 Deeside Park Junctions Improvement is a Highways England major scheme to provide grade-separation at two junctions on the route of the A494, A550 and A5117, and to extend the M56 motorway to bypass a third junction. The scheme extends over three miles, almost all of which is in Cheshire, apart from a short section falling within Flintshire.

Construction began in October 2006; all the junction improvements were operational by December 2008, with full scheme completion in March 2009. This report is the five years after study of the scheme.

Scheme Objective (source: Environmental Statement)	Achieved?
To improve safety for all users	Yes
To benefit the economy by reducing congestion and improving journey time reliability	Yes
To minimise adverse impacts to people, property, landscape, and sensitive ecological areas	Yes
To improve access to local communities and business	Yes
To provide a safe route for cyclists, pedestrians, and horse-riders	Yes

Summary of Scheme Impacts

Key impacts

- The A494/A550 section of the scheme is used by over 70,000 vehicles per day (vpd) on weekdays.
- Increased traffic on the section of road through the scheme is the result of rerouting traffic; especially strategic east-west traffic from the alternative section of the A55.
- Traffic flows are lower than predicted due to influences beyond the scheme.
- Journey times have improved and congestion reduced through the provision of free-flow movements for strategic traffic at the junctions.
- The number of injury collisions has reduced significantly, more than was forecast.
- Economic evaluation shows the scheme to be value for money.
- The provisions for cyclists, pedestrians and horse riders have improved as a result of measures built into the scheme and these are being well-used.

Traffic

- The section of A494/A550 improved by the scheme is used by over 70,000 vehicles per day on weekdays, an increase of 10% since before construction.
- Increased traffic on the section of road through the scheme is the result of rerouting traffic especially strategic east-west traffic from the alternative section of the A55.
- Traffic through the scheme is 14% lower than predicted due to the trend in recent years recent of lower traffic linked to the economic downturn also due to the A494 widening scheme on the adjacent section of road in Wales not being built.

- Vehicles using the A494/A5117 through the improved junctions experience journey time savings in all periods and both directions.
- The greatest time savings are in the peak periods, particularly westbound, which saw a saving of 4.5 minutes in the AM peak, while there were at least 30 seconds savings in the inter-peak.
- Reliability on this route has been improved through increased capacity and free flow movement of the trunk road through the junctions.

Safety

- Collision numbers on the roads through the scheme have reduced post-opening by 49%, an annual saving of 14 collisions. This reduction has included the national trend of background reduction; is statistically significant hence is attributed the scheme.
- Woodbank junction which is now mainly grade-separated, has seen the greatest safety improvement.
- The collision rate on the A494 (formerly A5117), which takes into account the extra traffic on this route, has decreased by a significant 58%.
- Collisions which are classed as slight have reduced at a greater rate than the much smaller number of serious and fatal ones, so the overall severity index has increased slightly from 13% to 16%.
- The collision savings are 41% higher than forecast.

Environment

- Observed traffic flows are lower than predicted at two locations on the A494/A5117 within the scheme and slightly higher in on the A494 near Queensferry, west of the scheme. Based on POPE methodology, predicted noise impacts remain as expected and air quality impacts are presumed better than expected.
- Woodland and hedgerow planting within the scheme is progressing well and is expected to reach its design year growth targets. However, handover maintenance requirements including control of noxious weed growth, removal of plant shelters and recent plant replacement appear to have not been undertaken. The lack of maintenance has impacted particularly in species-rich grassland where noxious weeds have remained uncontrolled.
- Gateway features of a lion and a dragon along the lines of the white horse carving of Wiltshire were installed on the verges at the boundary between England and Wales, however these do not appear to have received recent maintenance to ensure the visibility and definition of the features is maintained.
- Growth within planting plots is progressing well. Although there was initial post opening monitoring of great crested newts, bats and breeding birds, the planned further biodiversity monitoring in the aftercare period has not been done.
- Ponds appear to be operating as expected, although the pond south of the Deeside Park junction is showing signs of blockage / siltation at its outlet. Vandalism of this pond is also noted. It is unclear to POPE when this vandalism occurred and no information on frequency of maintenance inspections has been made available. Noxious weed growth is noted in some pond areas that has remained uncontrolled.
- All public rights of way (PRoWs) assessed show signs of use, including use by cyclists throughout the day and lunchtime pedestrians taking a break from the various offices located near Deeside Park junction. All PRoW appeared well-maintained for ease of use. Improvements at the various crossing points over the trunk roads are in place as expected.

Accessibility

- Provision for cyclists, pedestrians and horse riders is better than before the scheme was built as a non-motorised user route has been provided along the length of the scheme, improved crossings at Woodbank junction and the use of a new bridge over the A5117. This has reduced severance and improved accessibility.
- The scheme has not led to any change in public transport provision.

Integration

- The scheme has had no impacts on transport interchange.
- The scheme supports regional and local land use policies.

Summary of Scheme Economic Performance

All monetary figures in 2002 Prices and values			Forecast	Outturn re-forecast
Indirect Tax impact as increasing the cost	Present Value Benefits	Journey Times	£937.1m	£173.6m *
		Construction / Maintenance Impact	£-13.3m	
		Safety	£3.5m	£18.3m
		Total	£927.3m	£178.6m
	Present Value Costs (includes indirect tax)		£65.5m	£77.2m
	Benefit Cost Ratio (BCR)		14.2	2.3
Indirect Tax impact as reducing the benefit	Present Value Benefits (including indirect tax)	Total	£906.9m	£158.2m
	Present Value Costs		£45.1m	£56.8m
	Benefit Cost Ratio (BCR)		20.1	2.8

** The evaluation of the journey time benefits is based on A5117 corridor only whereas the forecast covered a very wide area extending from Flint to Chester and Ellesmere Port. Hence this figure represents an underestimate of the true benefits.*

- The investment cost of the scheme was £51.7million in 2002 prices, 18% above that estimated. This was partly due to additional costs of rerouting a major gas main.
- The journey time benefits are evaluated as £173.6million over 60 years over the local area only. This represents a conservative assessment of the benefits and is hence much lower than forecast which covered a much wider area and included the impacts of strategic rerouting.
- The monetary benefits of the savings in the number of injury collisions is evaluated as £18.3million over 60 years, higher than forecast despite including the impact of background reduction in collisions over this period.
- The outturn BCR assessments are over 2, despite only a conservative assessment of the benefits, and this represents over £2 of benefits for every £1 spent which is considered as high value for money.

1. Introduction

Background

1.1. The A5117 / A550 Deeside Park Junctions Improvement is a Highways England major scheme which opened in March 2009. The scheme has improved a section of the A550/A5117 within the counties of Cheshire and Flintshire between the M56 junction 16 and Deeside Park junction (A550/A548) including three junctions covering 5km (3.1miles).

1.2. Note that following scheme completion, the improved through route from M56 into Flintshire was renumbered as the A494, although it is widely still labelled with the original numbers on online mapping services.

1.3. The A5117 (now A494) is a dual carriageway road extending for a distance of approximately 3km west from the end of the M56 motorway, north of Chester. It connects with the A550 where a further 2km connects the route with the Deeside Park Junction, and forms part of the strategic route between Northwest England and North Wales. It is part of the Trans-European Network (TERN) linking the ports of Immingham with Holyhead. Deeside Industrial Park is a major employment site located immediately west of the scheme. The location of the scheme and its context within the road network is shown below in Figure 1.1.

Figure 1-1 Location of A5117/ A550 Deeside Park Junction Improvements

1.4. This report is the five years after (FYA) study of this scheme.

Problems addressed by the scheme

1.5. The Appraisal Summary Table (AST) for this scheme noted that the problems addressed by the scheme were traffic congestion and delay at four junctions on A5117/A550, for both

through and cross movements. These problems were due to low mainline capacity and a large number of conflicting vehicle movements.

History of the Scheme

1.6. Table 1.1 summarises the timeline of this scheme.

Table 1.1 History of Key Dates

Date	Summary
February 2002	Scheme to improve the three junctions at Deeside entered the Targeted Programme of Improvements (now known as the Major Schemes Programme) and preferred route confirmed by Secretary of State
June 2002	Public consultation
September 2003	The contract was awarded under Early Contractor Involvement (ECI)
October 2005	Public Inquiry
May 2006	Scheme approved by Secretary of State (SoS)
October 2006	Start of works
December 2008	Junction improvements all operational
22 August 2008	Full scheme completion
December 2010	Publication of One Year After (OYA) Post Opening Project Evaluation report.

1.7. It is also worth noting that before construction this scheme began, a complementary scheme was completed on the adjacent section of the A494 in Flintshire in November 2006. This was the A494/A550 Deeside Park to Drome Corner widening (shown in Figure 1.1), in which a 2.4km section of road was widened from dual carriageway 2 lanes to dual three-lanes, to cope with traffic growth and reduce collisions and new local road between Deeside Park Interchange and Sealand Road.

Objectives of the scheme

1.8. The scheme objectives, as given in the Environmental Statement and the Opening Brochure, were to:

- Improve safety for all users;
- Benefit the economy by reducing congestion and improving journey time reliability;
- Minimise adverse impacts to people, property, landscape, and sensitive ecological areas;
- Improve access to local communities and businesses; and
- Provide a safe route for cyclists, pedestrians, and horse riders.

Scheme details

1.9. The key features of the scheme are summarised below in Table 1-2. The previous road layout is shown in Figure 1-2, and the layout post scheme opening is shown in Figure 1-3.

Table 1-2 Key features of the scheme

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Throughout

- A5117/A550 junctions bypassed or grade separated giving free-flow from the western end of the M56 to the A494 in Wales.
- Direct access from frontage properties to mainline removed and alternative access provided.
- All-purpose route for pedestrians, cyclists and horse riders with safe crossings along full length of scheme from Deeside Park to Dunkirk junction.

Environmental mitigation

- Low noise surfacing on new sections
- Environmental mitigation measures including screening , plantings, ponds, and drainage

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Deeside Park Junction to Woodbank Junction

- Signalised Woodbank Junction bypassed by a new 2-lane all-purpose dual carriageway
- Former alignment of the A550 between Deeside Park and Woodbank junctions now carries northbound-only traffic between the two junctions, and new slip roads have been constructed enabling southbound A550 traffic to join the new mainline dual carriageway, and to reach the Deeside Park roundabout
- A new slip road also enables westbound traffic from the A5117 to reach Deeside Park junction. However, traffic from Deeside Park wishing to use the A5117 eastbound, is required to do so via the slip road from Woodbank Junction

Woodbank Junction to Parkgate Road Junction

- Existing 2 lane all-purpose dual carriageway remains in place
- New bridge connects the previously severed sections of Lodge Lane providing access to farms and for use by non-motorised users
- A494 enters underpass at Parkgate Road Junction

Parkgate Road Junction to Dunkirk Junction

- Parkgate Road Junction becomes grade-separated
- New all-purpose 2 lane dual carriageway providing a direct link between the A494 and the western end of the M56 via an underpass
- Roundabout retained with access to services
- All –movements access to the A540 Parkgate Road
- Dunkirk junction roundabout retained with direct sliproads to and from eastbound carriageway of A5117
- Two way road connecting A540 Parkgate Road and Dunkirk junction (A5117)

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Figure 1-2 Old Road Layout

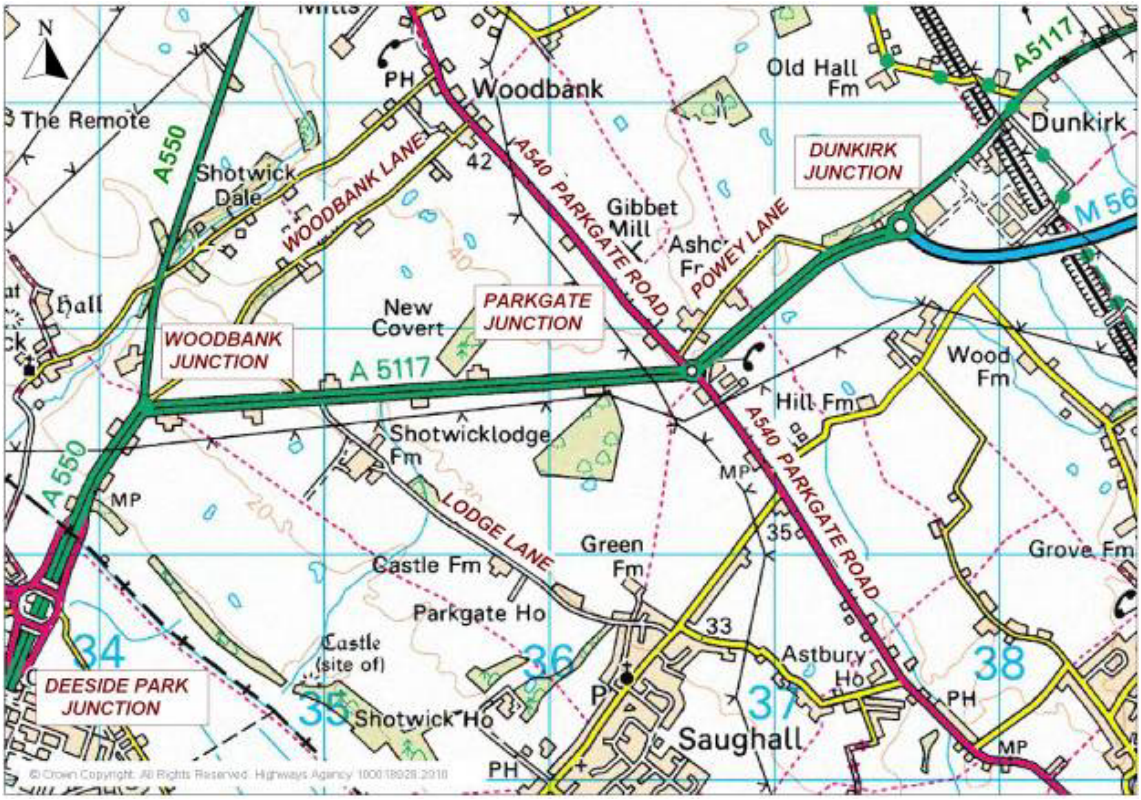
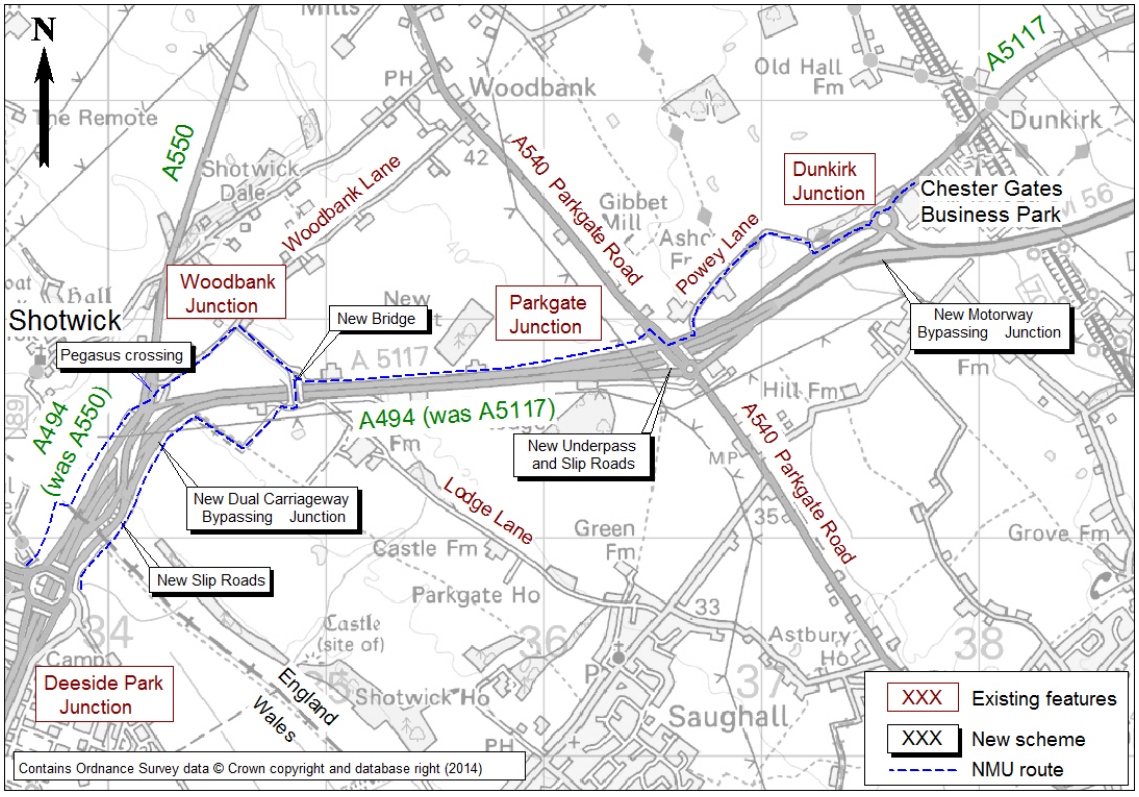


Figure 1-3 New Road Layout and Key Features of scheme



1.10. The scheme falls within Highways England Area 10. The greater part of the scheme is in Cheshire, but a length of approximately 200 metres at the western end is within Flintshire i.e. in Wales and hence outside of Highway England's direct remit. Funding contributions were made by the Welsh Assembly, and by the Trans-European Transport Network Executive Agency.

Other nearby schemes

1.11. Proposals to improve the linkage between the A494, west of the scheme in Wales with the A55 were included in the Do Minimum scenario in the Traffic Forecast report's appraisal for the Deeside Park junction scheme which is the subject of this study. However the proposals for the Welsh scheme failed to gain approval at a Public Inquiry in 2008, and have consequently not been built. The proposed improvements were:

- A494 from A548 east Sealand Road to B5125 The Highway, (would have started in 2007);
- A494 from B5125 The Highway to A55 Junction 34, (would have started after 2010); and
- A55 from Junction 34 with A494 to Junction 33 with A5119 (would have started after 2010).

Post Opening Project Evaluation (POPE)

Highways England Appraisal Process

1.12. Highways England is responsible for improving the strategic highway network (motorways and trunk roads) through the Major Schemes programme. At each key decision stage through the planning process, schemes are subject to a rigorous appraisal process to provide a justification for the project's continued development.

1.13. When submitting a proposal for a major transport scheme, the Department for Transport (DfT) specifies that an Appraisal Summary Table (AST) is produced which records the degree to which the five Government objectives for Transport (Environment, Safety, Economy, Accessibility and Integration) have been achieved. The contents of the AST allow judgements to be made about the overall value for money of the scheme among other things. The AST for this scheme is presented in Table 7-1 of this report.

Overview of POPE

1.14. POPE studies are carried out for all Major Schemes to evaluate the strengths and weaknesses in the techniques used for appraising schemes. This is vital so that improvements can be made in the future. For POPE, this is achieved by comparing information collected before and after the opening of the scheme, against predictions made during the planning process. The outturn impacts of a scheme are summarised in an Evaluation Summary Table (EST) which summarises the extent to which the objectives of a scheme have been achieved. The EST for this scheme can be found in Table A.2 of this report.

Structure of the Report

1.15. The remainder of this report is structured as follows:

- **Section 2 – Traffic Analysis**. This section presents analysis of the traffic impacts of the scheme and includes a comparison of the before and after traffic and journey times on the A21, former A21 and other local routes. A comparison of outturn and forecast traffic flows is also made;

- **Section 3 – Safety**. This section discusses changes in injury collision patterns and personal security as a result of the scheme;
- **Section 4 – Economy**. This sections presents an evaluation of the scheme's economic costs and benefits;
- **Section 5 – Environment**. A review of the environmental impacts of the scheme is given and supported by an evaluation of the mitigation measures described within the scheme's Environmental statement;
- **Section 6 – Accessibility and Integration**. A review of how the scheme has affected accessibility for pedestrians, cyclists and public transport users is presented. Furthermore, a review of how the scheme links with wider policy objectives is also given;
- **Section 7 – Appraisal and Evaluation Summary Tables**. This section contains an overview of the actual scheme impacts (in the form of an EST) compared to those predicted in the original Appraisal Summary Table (AST); and
- **Section 8 – Conclusions**.

1.16. Technical terms and abbreviations are set out in the glossary in Appendix D.

Sources

1.17. The following sources were used in compiling this report:

- Traffic data from Highways England, TrafficWales, Cheshire County Council (2006), Cheshire West and Chester, and Flintshire County Council;
- Collision data from DfT online database;
- Traffic Survey Report, November 2004;
- Local Model Validation Report, November 2004;
- Traffic Forecasting Report, February 2005;
- Economic Assessment Report, February 2005;
- Environmental Statement, March 2005;
- Non-Technical Summary of the Environmental Statement, March 2005;
- Appraisal Summary Table, March 2005; and
- Other environmental documents as detailed in the relevant section.

2. Traffic Impact

Introduction

2.1. In order to assess the traffic impact of the scheme, this chapter reports on changes in traffic flows and journey times and how these changes compare with those forecast. The traffic flow and journey time analysis covers:

- Long term traffic volume trends in this area;
- Comparisons of before and after opening traffic flow volumes on the A494/A5117/A550 and surrounding road network over a wide area;
- Comparison of the traffic data forecasts with the observed traffic volumes;
- Comparisons of journey times before and after opening on the A5117/A550/A494; and
- Comparison of changes in journey times with that forecast.

Sources

2.2. This section uses data from the following sources as detailed below.

Traffic count data

2.3. Traffic flows have been measured by Automatic Traffic Counters (ATC). This data was obtained from the following sources:

- Highways England Traffic Data System (TRADS) for motorways and trunk roads in England.
- The Traffic Wales Database for motorways and trunk roads in Wales.
- Cheshire County Council (2006) and Cheshire West & Cheshire Council (2010 and 2014).

Journey times

2.4. Journey times have been obtained from the following sources:

- Moving observer surveys before start of construction and OYA.
- Sat-nav[1] data from vehicles using the route at the FYA stage.

2.5. Forecasts of the changes in traffic flows and journey times and the background to the traffic modelling of this scheme has been taken from the following reports:

- Final Report of Transport Surveys April 2004.
- Traffic Forecasting Report (TFR), February 2005.
- Local Model Validation Report (LMVR), Oct 2004.

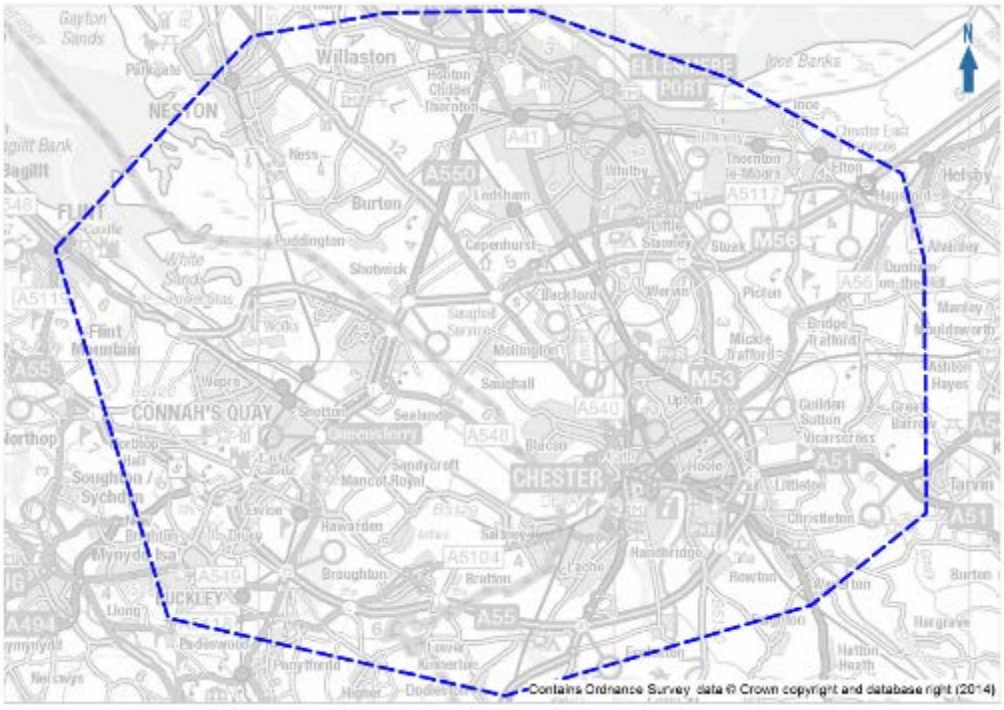
Modelling

2.6. Traffic modelling of the scheme was undertaken in SATURN using variable demand modelling. The modelled network incorporated Chester, Ellesmere Port and Connah's Quay, although little detail was included in the urban areas. The wide-area coverage of the network

[1] Drivers who use satellite navigation devices have the option to voluntarily allow anonymous data about their journeys to be collected and used to provide a range of services, including the analysis of historic journey times along specific routes. This data is not available for the before start of construction period.

was chosen so that the main alternative parallel route to the A5117, namely the A55 Chester southern bypass, is also included, thereby enabling the model to represent traffic re-assignment between the two routes. The extent of the A5117 SATURN network is shown in Figure 2-1.

Figure 2-1 Extent of SATURN model network



2.7. Central (most likely) case, low and high forecasts were assessed in the modelling. Local traffic growth forecasts were determined in consultation with Cheshire County Council, Flintshire County Council, Chester City Council, and Ellesmere Port and Neston Borough Council. These local authorities were consulted with regard to the accuracy of the TEMPRO planning data; and information from the local highway authorities was sought regarding likely forthcoming road schemes.

2.8. The base model used 2003 traffic data.

2.9. Modelling used trip suppression (reduction of the number of trips in response to congestion) from full growth in all situations, in both the do minimum (DM) and do something (DS) networks. The greatest trip suppression was forecast during the PM peak in the DM scenario. This was forecast to be -2% in 2012.

2.10. The Do Minimum model included a number of schemes which were detailed in the TFR. These schemes and the current status are listed in Table 2-1. All highways improvements included in the DM were also included in the DS scenario. These schemes included points on the modelled network which were expected to experience congestion from 2007 onwards as a consequence of local development plans.

Table 2-1 Component schemes in the Do Minimum highway network (as modelled in 2005)

Scheme description	Status as of late 2014
Firm commitments	
A494/A550 Widening Deeside Park junction – Ewloe (D3AP)	Rejected by Public Inquiry inspector and dropped by Welsh Assembly Government in March 2008 Currently in Draft North Wales Joint Local Transport Plan (2014)
A55/A483 junction capacity improvements (for Chester Business Park)	Under construction
Connah's Quay – Shotton Local Distributor Road (S2AP)	Completed early 2014
A548 Connector Road Deeside Park – Drome Corner (S2AP)	Completed prior to this scheme
Junction improvements at A550/A494/A548 Deeside Park Roundabout (New Traffic Signals)	Completed prior to this scheme
Potential schemes	
Chester Western Relief Road A55-A548 (S2AP)	Options currently being considered
M53 Junction 10 capacity improvements (for Cheshire Oaks)	Assumed completed as this was a condition of the business park development

2.11. The key difference shown here with the greatest impact on traffic through the scheme is the rejected A494/A550 widening which lies immediately west of the A5117/A550 Deeside Park Junction improvements scheme evaluated in this report. The two schemes cover the link between the M56 and the A55 which is part of the TERN network.

Traffic Volumes

Background Changes in Traffic

2.12. Historically in POPE scheme evaluations, the 'before' counts have often been factored to take account of background traffic growth so that they are directly comparable with the 'after' counts. This usually involves the use of National Road Traffic Forecasts (NRTF), with local adjustments made using National Transport Model (NTM) Local Growth Factors.

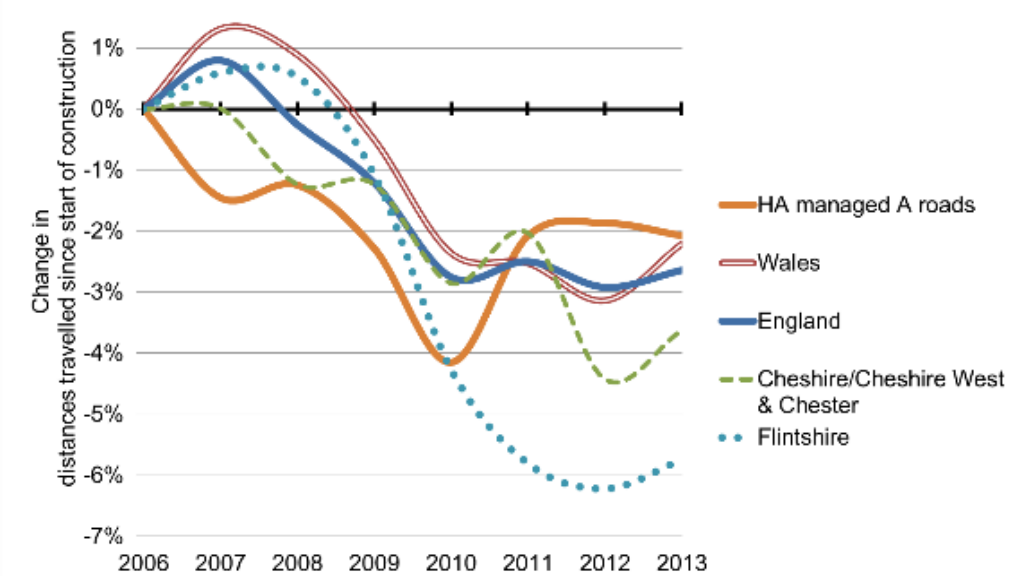
2.13. However, in light of the recent economic climate, which has seen widespread reductions in motor vehicle travel in the UK as a whole since 2008, it is no longer deemed appropriate to use this method of factoring 'before' counts to reflect background changes in traffic. Rather, recent POPE studies have taken a more considered approach in order to assess changes in the vicinity of the scheme, within the context of national, regional and locally observed background changes in traffic.

National, Regional and Local Trends

2.14. The best measure of the wider trends in overall traffic levels both regionally and nationally is shown in DfT annual statistics for total distance travelled (million vehicle kilometres). Figure 2-2 shows the changes by year in the period from 2006 (at start of construction) and 2013

(the latest available) for the two local authorities in which it lies, and 'A' roads managed by Highways England and for England and Wales.

Figure 2-2 National and Regional Trends



2.15. It can be seen from Figure 2-2 that since the start of scheme construction in 2006, traffic has fallen by several percentage points and the two local authorities most relevant to this scheme have seen a greater than average fall. This is strongly linked to the economic downturn starting in 2008.

Observed Flows before construction, One Year After (OYA) and Five Years After (FYA)

2.16. This section of the report uses data from a variety of sources to inform the before and after analysis of changes in traffic volumes for the scheme. To complete this evaluation, traffic flow data from before the start of construction and one and five years post opening is compared.

2.17. Traffic volumes were obtained for the following periods:

- September 2006 - before the start of scheme construction,;
- September 2010 – OYA; and
- September 2014 – FYA.

2.18. The data here is average weekday (AWT) and average 7-day daily (ADT) flows, without correction for background growth.

2.19. Comparisons of 24-hour average weekday traffic (AWT) flows for the pre-scheme and post-opening periods are presented on the map in Figure 2-3.

Figure 2-3 Traffic flows (AWT)

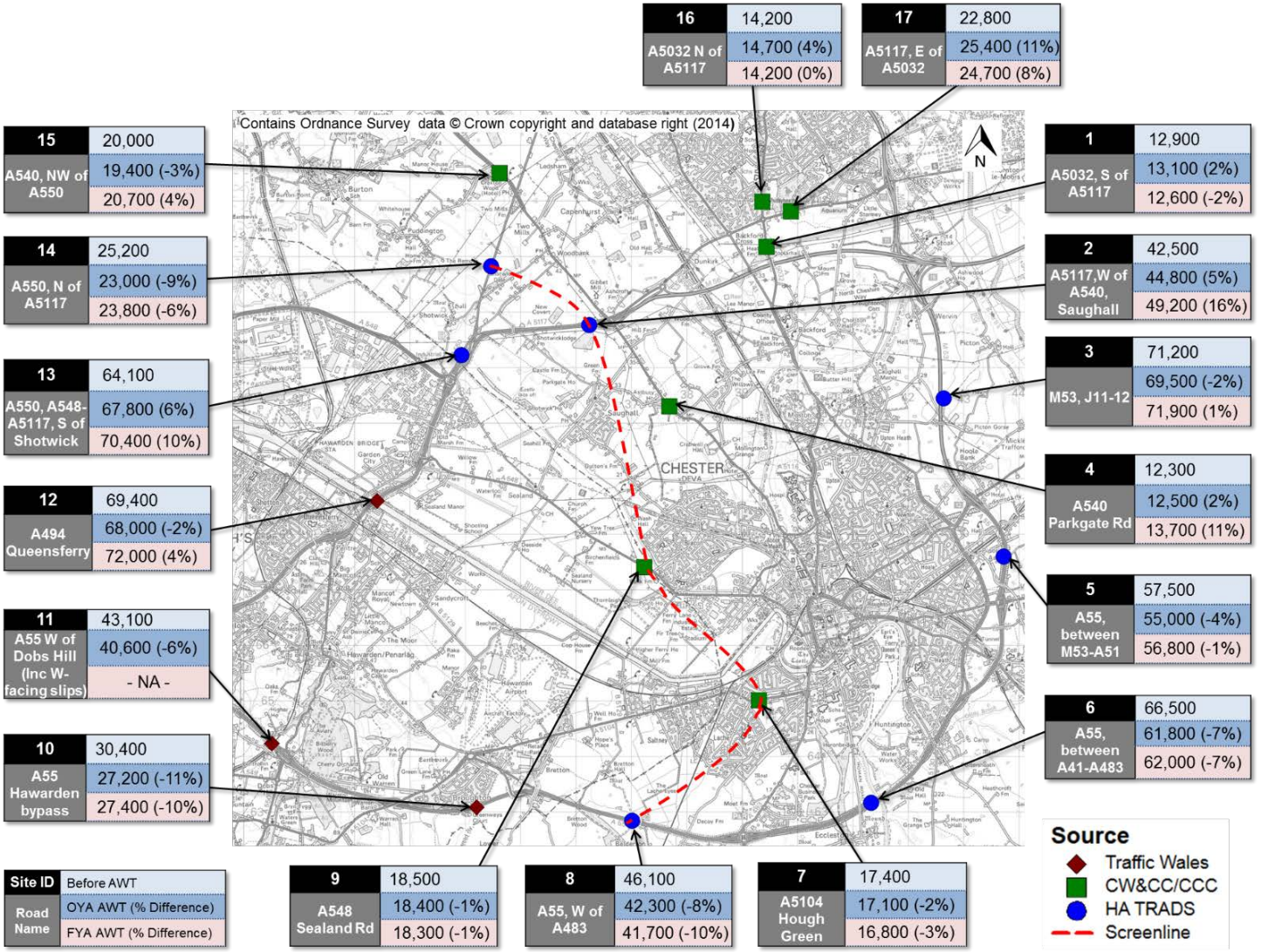


Table 2-2 Observed Traffic Flows (ADT/AWT) before and after

	Location Description	ADT							AWT						
		Before	OYA	FYA	Before/OYA		Before/FYA		Before	OYA	FYA	Before/OYA		Before/FYA	
					Diff	%Diff	Diff	%Diff				Diff	%Diff	Diff	%Diff
1	A5032, South of A5117	12,100	12,300	11,900	200	2%	-200	-2%	12,900	13,100	12,600	200	2%	-300	-2%
2	A5117,west of A540, Saughall	41,200	43,200	47,200	2,000	5%	6,000	15%	42,500	44,800	49,200	2,300	5%	6,700	16%
3	M53, J11-12	65,700	64,500	66,800	-1,200	-2%	1,100	2%	71,200	69,500	71,900	-1,700	-2%	700	1%
4	A540 Parkgate Rd	11,500	11,600	12,600	100	1%	1,100	10%	12,300	12,500	13,700	200	2%	1,400	11%
5	A55, between M53-A51	52,800	50,400	52,500	-2,400	-5%	-300	-1%	57,500	55,000	56,800	-2,500	-4%	-700	-1%
6	A55, between A41-A483	61,500	57,600	57,300	-3,900	-6%	-4,200	-7%	66,500	61,800	62,000	-4,700	-7%	-4,500	-7%
7	A5104 Hough Green	16,300	15,900	15,600	-400	-2%	-700	-4%	17,400	17,100	16,800	-300	-2%	-600	-3%
8	A55, west of A483	43,100	39,700	38,600	-3,400	-8%	-4,500	-10%	46,100	42,300	41,700	-3,800	-8%	-4,400	-10%
9	A548 Sealand Road	17,600	17,400	17,200	-200	-1%	-400	-2%	18,500	18,400	18,300	-100	-1%	-200	-1%
10	A55 Hawarden Bypass	29,100	26,100	26,600	-3,000	-10%	-2,500	-9%	30,400	27,200	27,400	-3,200	-11%	-3,000	-10%
11	A55 west of Dobs Hill	40,400	37,800	-	-2,600	-6%	-	-	43,100	40,600	-	-2,500	-6%	-	-
12	A494 Queensferry	65,300	65,100	69,500	-200	0%	4,200	6%	69,400	68,000	72,000	-1,400	-2%	2,600	4%
13	A494/A550	60,800	64,400	69,200	3,600	6%	8,400	14%	64,100	67,800	70,400	3,700	6%	6,300	10%
14	A550, north of A5117	23,100	21,200	22,000	-1,900	-8%	-1,100	-5%	25,200	23,000	23,800	-2,200	-9%	-1,400	-6%
15	A540, North west of A550	19,200	18,400	19,300	-800	-4%	100	1%	20,000	19,400	20,700	-600	-3%	700	4%
16	A5032 north of A5117	13,200	14,100	13,000	900	7%	-200	-2%	14,200	14,700	14,200	500	4%	0	0%
17	A5117, East of A5032	21,900	24,200	23,900	2,300	11%	2,000	9%	22,800	25,400	24,700	-	-	1,900	8%
Scheme sections															

2.20. From the traffic flow data on the roads around the scheme shown in Figure 2-2 and Table 2-2 the following key points are shown:

- The combined section of A550/A494 (site 13) improved by the scheme is used by over 70,000 vehicles per day (vpd) on weekdays, an increase of 10% from before construction.
- The A5117 between the grade separated junctions saw an increase to 49,200 (site 2) vpd on weekdays.
- The two count locations within the scheme (highlighted in green sites 2 and 13) show increased traffic flows at OYA compared with before construction flows;
- Conversely traffic is reduced on the alternative route for east-west strategic traffic on the A55 (sites 6, 8, and 10), showing that the additional traffic on the scheme is longer distance traffic which has rerouted to the improved road; and
- The A494 in Queensferry (site 12) also shows increased traffic which can be attributed to rerouting into the corridor using the scheme. This increase is lower though, which can be attributed to the congestion remaining on this route which is still the subject of uncertainty over widening plans which had been assumed as a certainty when the Deeside Park Junctions scheme was planned.

Screenlines

2.21. In order to further investigate reassignment as a result of the scheme over a wide area, a screenline analysis has been undertaken using the count sites presented earlier. Screenline analysis allows for a better understanding of vehicle movements across a wider corridor area by totalling the flows on a set of sites. The intention is to count vehicles at only one of a set of sites for each journey they make.

2.22. One strategic screenline has been identified for this study to cover east-west movements north and south of Chester including through this scheme. This line and the sites included are shown in Figure 2-3.

Table 2-3 East – West Screenline

Map Ref	Description	AWT						
		Before	OYA	FYA	diff	%diff	diff	%
14	A550, north of A5117	25,200	23,000	23,800	-2,100	-8%	-1,300	-5%
2	A5117, west of A540, Saughall	42,500	44,800	49,200	2,300	5%	6,700	16%
9	A548 Sealand Road	18,500	18,400	18,300	-200	-1%	-200	-1%
7	A5104 Hough Green	17,400	17,100	16,800	-300	-2%	-600	-4%
8	A55, west of A483	46,100	42,300	41,700	-3,800	-8%	-4,400	-9%
Total		149,700	145,600	149,800	-4,100	-3%	200	0%

2.23. Analysis of traffic flows on the sites across the screenline shows:

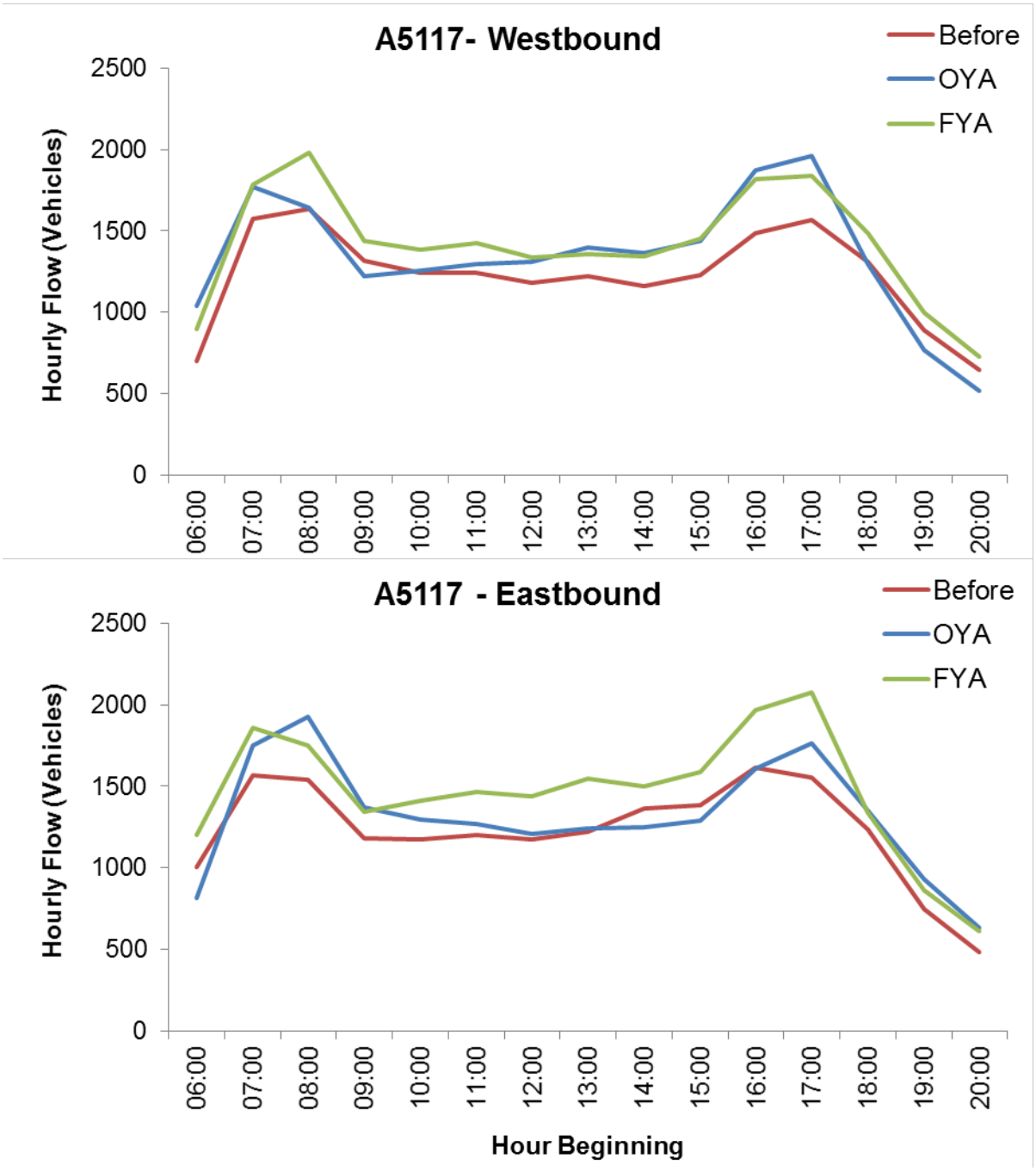
- Total flow across the screen is the same as FYA that it was before scheme construction.
- This shows that the increase in traffic seen on the scheme (site 2 here) is balanced out by reductions on other roads across the screenline which shows that rerouting is the primary reason for the increase in traffic on the A5117.

- A55 traffic level have shown the greatest reduction, strongly indicating that some east-west strategic traffic has rerouted from the A55 to the alternative, shorter trunk road route via the scheme rather than the south of Chester route.

Hourly flow profiles

2.24. Figure 2-4 below shows the profile of the traffic flows on the A5117 before and after by hour. This is based on September flows for 2006, 2010, and 2014.

Figure 2-4 Hourly Traffic Flows by Direction (Sept, Monday – Thursday)



2.25. These hourly flows plots show:

- The additional traffic on the A5117 is spread throughout the day. The fact there has been no change in the duration of the peak periods as shown by the hours with the maximum traffic flows, shows that before the scheme was built, peak period traffic had not been forced to travel at other times (i.e. there was no peak spreading).
- The peak period traffic flows are not much greater than the interpeak period and show no clear evidence of tidality.

2.26. Further examination, not shown here, indicates that importance of this route for holiday traffic. The highest hourly flows in September were on Friday afternoon/evening period westwards and Sundays afternoon/evening show the reverse tidal flow.

Forecast vs observed traffic flows

2.27. Predicted flows were contained in the Traffic Forecasting Report (TFR) of February 2005 for the expected opening year of 2007 and the design year of 2022.

2.28. To consider how close the forecasts were for selected locations, a proxy forecast for 2014 has been created using interpolation (straight-line) to 2014 between the Do Something values for the opening year and design years as shown in Table 2.6. To distinguish between differences caused post opening, and those that existed before construction started, we also compare the modelled do minimum against the observed traffic flows just prior to start of works.

Table 2-4 Forecast vs Observed Traffic Flows without scheme

Map Ref	Description	AADT		
		Forecast DM 2007	Observed Before construction 2006	Diff %
2	A5117,W of A540, Saughall	42,100	41,200	-2%
12	A494 Queensferry	54,300	65,300	20%
13	A550 between A5117 and A494	64,300	60,800	-5%
14	A550, N of A5117	21,500	23,100	7%

2.29. The key points regarding the accuracy of flows before the start of construction are :

- Traffic flows on the A494 Queensferry (site 12) just inside the Welsh border, were already 20% higher than modelled. This is despite the planned widening of this section (see Table 2-1).
- Flows on the sections of road due to be improved by the scheme under evaluation in this report were slightly below forecast.

Table 2-5 Forecast vs Observed Traffic Flows for 2014 with scheme

Map Ref	Description	AADT		
		Forecast DS Interpolated 2014	Observed With scheme 2014	Diff %

Map Ref	Description	AADT		
		Forecast DS Interpolated 2014	Observed With scheme 2014	Diff %
2	A5117,W of A540, Saughall	55,100	47,200	-14%
12	A494 Queensferry	67,500	69,500	3%
14	A550, N of A5117	25,800	22,000	-15%

2.30. The key points shown regarding the accuracy of traffic forecasts at FYA are:

- Traffic flows through the scheme (as seen on site 2) are 14% below forecast.
- West of the scheme on the A494 at Queensferry, the flow is close to the forecast but this accuracy is misleading because, as shown in Table 2-4, the DM forecast was too high. Without this level of error, flows here would be below forecast.

2.31. The model predicted high traffic growth in this corridor (linking M56 to A55) and the reasons why this has not occurred are partly due to the expected general traffic growth not occurring in recent years (as shown in Figure 2-2) but are probably also due to A494 widening in Wales not having been undertaken as modelled

2.32. The TFR did not include the detail of traffic flow predictions on the A55, so no assessment of the accuracy of forecast rerouting is possible here.

Journey Time Impact Analysis

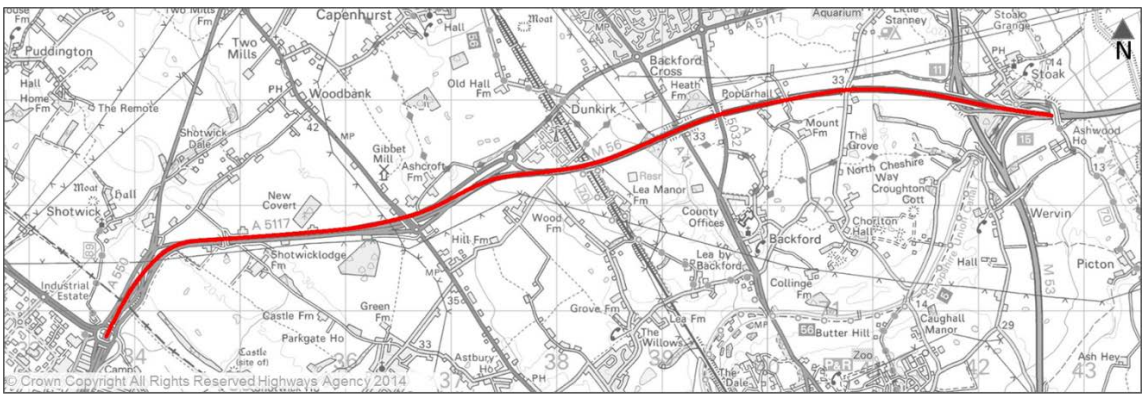
2.33. Prior to the start of construction of this scheme, journey times were surveyed by the moving observer method in early July 2006, and one year after opening (April 2010), with the intention of discovering how the scheme had affected times along the improved route itself. Six journey time runs were made in each direction on weekdays, in each time period (AM peak, Interpeak, PM peak). More recently POPE studies have changed to using sat-nav data as a better source of journey time surveys and this data was used for the FYA data here.

2.34. Figure 2-5 shows the route through the scheme which has been used.

2.35. The journey time analysis is split into two components:

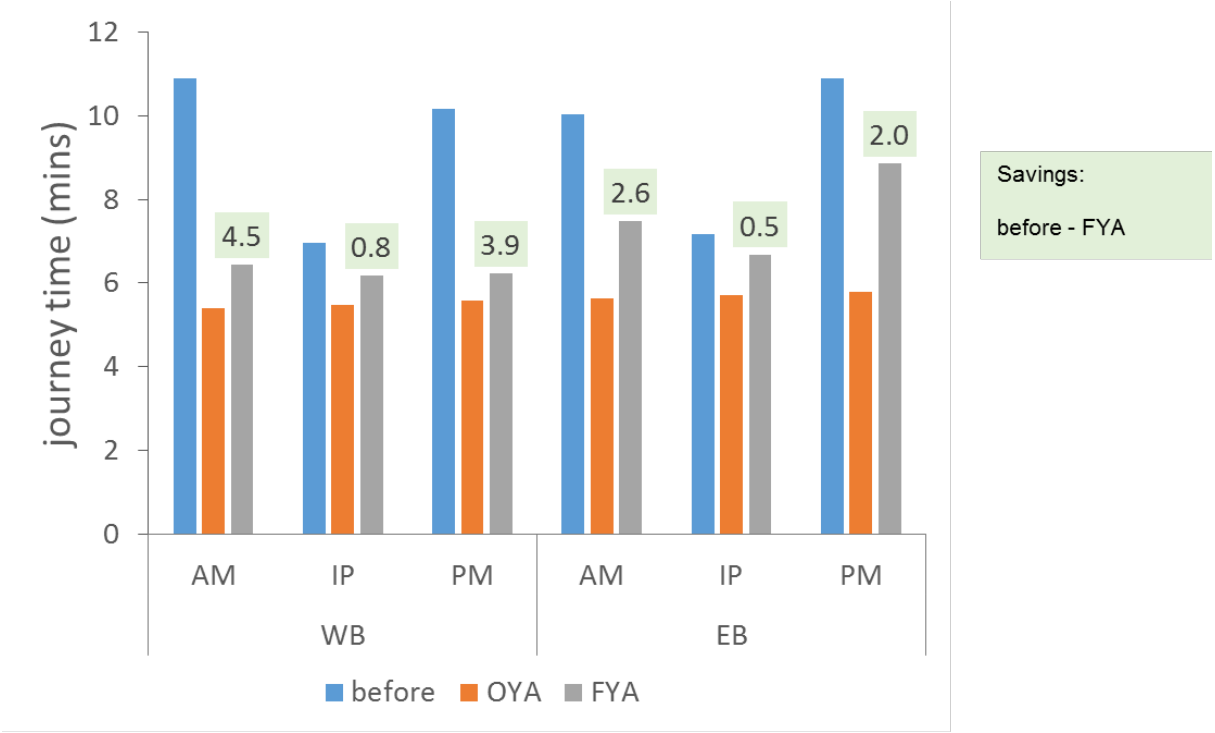
- Analysis of pre and post-scheme journey time differences along the scheme; and
- A comparison of forecast and outturn journey times along the scheme.

Figure 2-5 Journey time survey route



2.36. The savings are summarised in Figure 2-6.

Figure 2-6 Journey times for through traffic on A5117/A494 Deeside Park junction to Dunkirk



2.37. The key points shown here are:

- Savings are observed in all periods and both directions.
- Greatest savings are in the peak periods, particularly westbound, rising to 4 ½ minutes in the AM peak.
- Interpeak periods saw savings of ½ and ¾ minute.
- Savings are lower at FYA than observed at OYA which may be linked to increased traffic on this road as shown in Table 2-2, although it is acknowledged that it may also be partially due to the difference in data source.

2.38. It should be noted that the journey time results presented here are mid-week and do not cover the potentially much greater savings in the weekend peak periods during the summer.

Journey Time Comparison with Prediction

2.39. No prediction of journey time savings on specific routes were included in the TFR or Appraisal Summary Table (AST). Furthermore, forecasts for the key links could not be derived from the scheme's modelling because the appraisal was in SATURN and the economic appraisals in TUBA (Transport Users Benefit Appraisal) hence matrix-based (in contrast to the link-based approach used for many older schemes). Therefore it is not possible to extract time savings forecasts from the model output, nor are such figures given in the text.

2.40. In the absence of journey time predictions, no conclusions can be drawn as to the accuracy of forecast vs actual journey times reported by POPE.

Reliability

2.41. The AST included a forecast of the reliability impact of 'moderate beneficial' but no quantitative assessment of reliability benefits was made.

2.42. The OYA report evaluated reliability through comparing the variability of the moving observer journey times before and at OYA. Although this is based on a small sample size of surveys, this showed less variability in journey times, hence at OYA, journey time reliability was evaluated to be improved. At FYA journey times have been obtained from sat-nav data which has a much larger sample size, but as the sources of journey times are different, it cannot be compared with the earlier data so journey time variability cannot be assessed.

2.43. The basis of the AST forecast was that the scheme would improve reliability through:

Improved A5117 capacity, alignment and ease of junction access.

2.44. As the built scheme has increased capacity for the trunk road and provided free-flow movement for traffic which previously had to pass through an at-grade junction as was planned, it can be concluded that it has improved reliability as forecast.

Key Points – Traffic Impacts

Traffic Flows

- The combined section of the A494/A550 improved by the scheme is used by over 70,000 vehicles per day on weekdays, an increase of 10% from before construction.
- Increased traffic on the section of road through the scheme is the result of rerouting of traffic especially strategic east-west traffic from the alternative section of the A55.
- There was no peak spreading on the A5117 and the highest hourly flows are linked to holiday traffic flows towards Wales on Friday and away on Sundays.
- Traffic through the scheme is 14% lower than predicted due to widespread trend in recent years recent of lower traffic linked to the economic downturn but may also be due to the A494 widening scheme on the adjacent section of road in Wales not being built.

Journey Times

- Journey time savings are observed in all time periods and for both directions.
- The greatest savings are in the peak periods, particularly westbound, rising to 4 ½ minutes in the AM peak.
- No predicted time saving is available for comparison with observed.

Reliability

- Journey time reliability was shown to have improved with the scheme in place at OYA, and the increased capacity and free-flow movement for trunk road traffic means that it is still improved at FYA.

3. Safety Impacts

Introduction

3.1. This section of the report examines how successful the scheme has been in addressing the objective of improving safety. The focus of this objective is to reduce the loss of life, injuries and damage to property resulting from transport collisions and crime. This is assessed by analysing the changes in Personal Injury Collisions (PICs) occurring in the five years before start of construction and five years after completion.

3.2. The scheme had two safety objectives:

- Improve safety for all users.
- To provide a safe route for cyclists, pedestrians, and horse-riders.

Data Sources

3.3. For the purposes of this study, collision data has been obtained from the DfT database for the periods:

- Before start of construction: Oct 2001- Sept 2006.
- Post opening: Jan 2009 – Dec 2013.

3.4. The collision data is based on the records of personal injury collisions (PICs) recorded in the STATS19 data collected by the police when attending collisions. Damage only collisions are not included in this dataset and are thus not considered in this evaluation. .

3.5. The forecast of the safety impacts are based on:

- COBA model details of numbers of predicted collisions.
- Scheme's AST.

3.6. Analysis of the scheme's impact on Personal Security has been undertaken through use of the observations made during a site visit undertaken in Sept 2014.

Forecast Data

3.7. The forecast collision savings in the opening year for the area shown in **Figure 3-1** has been obtained from the COBA model. The forecast impact on safety is expressed in terms of numbers of PICs saved with a calculated corresponding economic impact. These forecast economic impacts are assessed against observed economic impacts in Chapter 4.

Observed Data

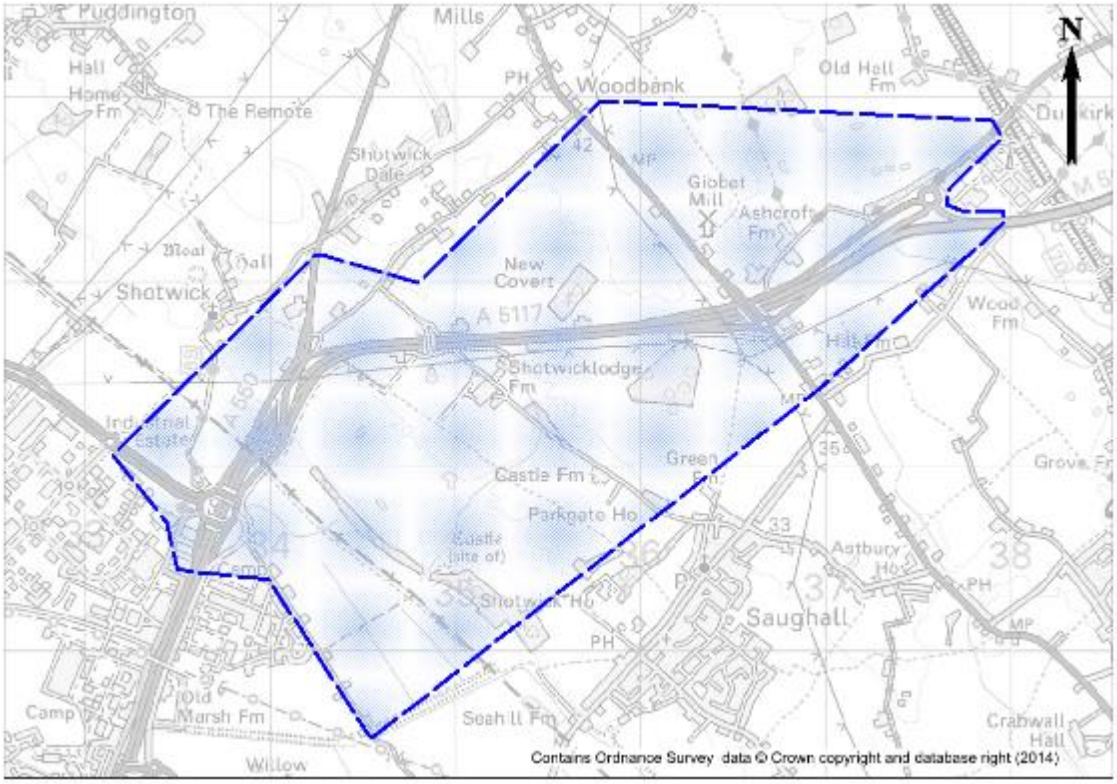
3.8. For the purposes of this study, collision data has been obtained from the DfT database for the periods:

- Before construction: October 2001 to September 2006.
- After completion: January 2009 to December 2013.

3.9. The data available for use in this report does not have any details on collision causation factors and hence the evaluation is limited to consideration of collision dates, severities and locations only.

3.10. Analysis of the scheme's impact on personal security has been undertaken through the use of observations made during a site visit carried out in September 2014.

Figure 3-1 Collision model area



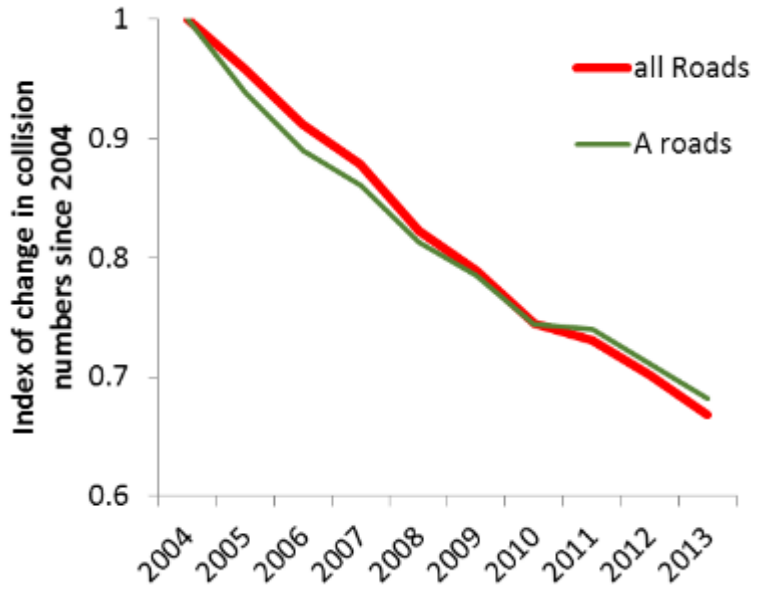
Background Changes in Collision Reduction

3.11. It is widely recognised that, for over a decade, there has been a year-on-year reduction in the numbers of personal injury collisions on the roads on the UK, even against a trend of increasing traffic volumes during much of that period. The reasons for the reduction are considered to be multi-factorial and include improved safety measures in vehicles and reduced numbers of younger drivers. We need to consider this background trend when considering the changes in collision numbers in the area. If the scheme had not been built, collision numbers in the area would still be influenced by wider trends. In the context of post opening evaluation, we refer to this as the counterfactual scenario.

3.12. The comparison needed for adjustment of the annual average collision data is between the middle of the five year period post opening (2011) and the five year period of the pre-construction period (2004). The change in the number of collisions between the pre-construction period and post opening periods can then be attributed to the scheme rather than wider national trends.

3.13. The approach is to use national data to calculate the national changes in the number of collisions occurring in this period on 'A' roads, which represents the A5117, A550 and A494 before scheme opening. Figure 3-2 presents the trend in collisions numbers by road type observed between 2004 and 2013.

Figure 3-2 National trends of number of Injury Collision numbers since 2004



*based on DfT statistics table RAS10002

3.14. The national trend of collision reduction has been that of a year-on-year reduction since the turn of the century. The trend for the period relevant to this study shows that the trend for rural 'A' roads is similar to the trend for all road types and that for the purpose of comparing the before and post opening periods of this scheme (as set out in paragraph 3.3), the rate of collisions in the later period is 75% of that in the before period.

3.15. One of the objective of this scheme was to improve safety. When analysing the collision numbers and rate, it is important to not attribute savings in the area simply to this scheme without considering this background trend. It is evident that, even had this scheme not been built by now, collisions are likely to have fallen due to the wider trends caused by a range of influences including improvements to vehicle safety and reductions in the numbers of young drivers. Thus the approach taken here, in common with the POPE methodology, is to calculate counterfactual collision numbers and rates to compare with the post opening data.

Collision Numbers

3.16. This section analyses observed changes in the number of PICs and the relative severity of collisions following scheme opening. It has not been possible to analyse changes in the number of casualties at OYA or FYA as casualty data could not be provided for the whole of the study area.

3.17. Annual collision numbers for the five years before scheme construction and five years after scheme opening are shown in Figure 3-3.

Figure 3-3 Number of Collisions by Year in Study Area

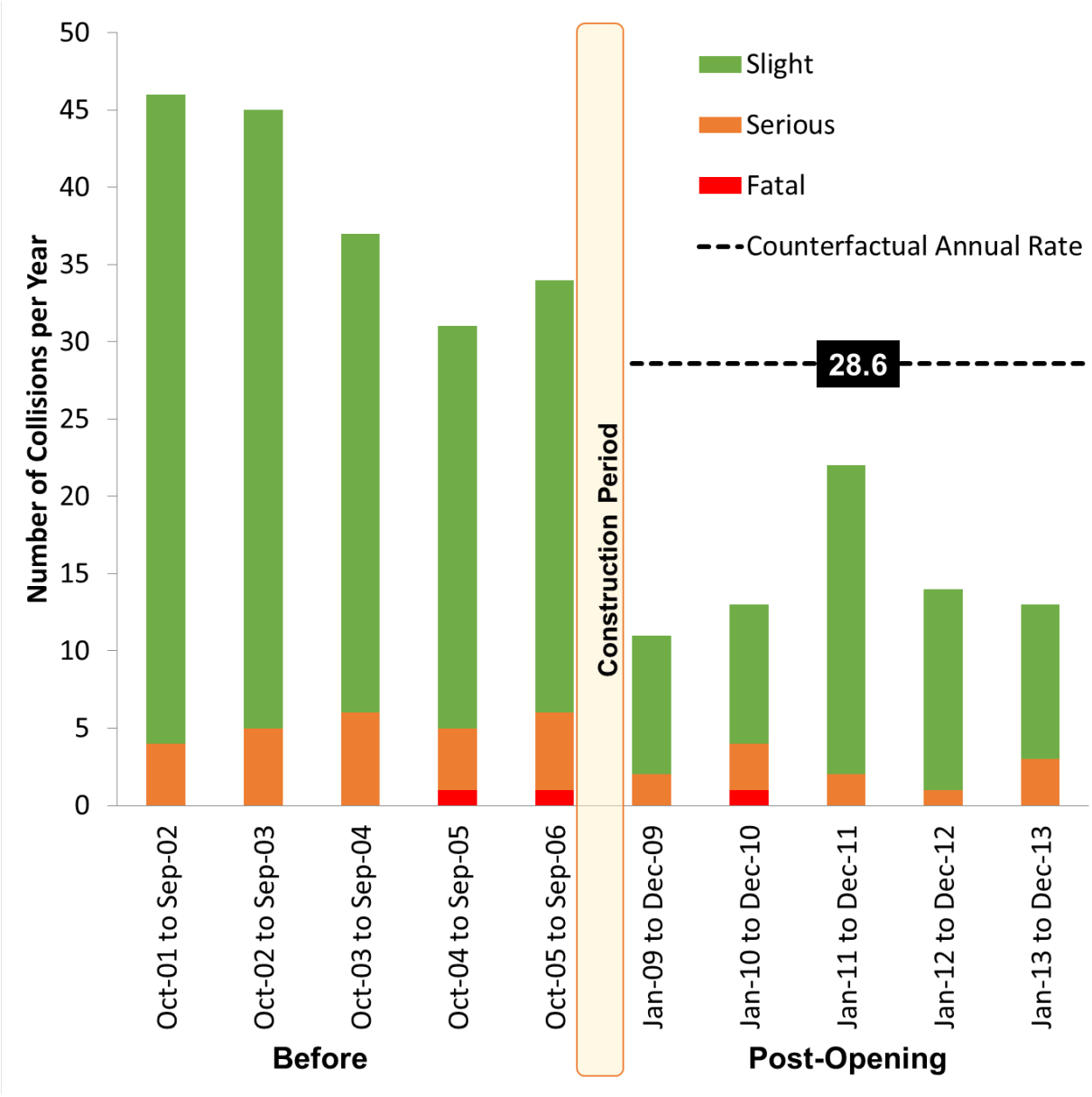


Table 3-1 Annual Average Number of Collisions in Study Area

	Before	After	Difference	% diff
Annual average	38.6	14.6	-14.0	-49%
Annual average (adjusted Counterfactual)*	28.6			

*Adjusted figure is the counterfactual annual average i.e. the estimated annual average if collisions risk due to the road layout was the same as observed before construction, reduced by the background trend observed nationally.

3.18. The key points regarding collision numbers in the study area shown in Figure 3-3 and Table 3-1. are:

- Although the before period shows a general trend in a reduction in collisions, the post opening period shows much lower annual totals for every year.

- The comparison between counterfactual expected annual rate of 28.6 PICs per annum, and the observed average in the post opening period shows a saving of 14 per annum (49%).
- Statistical significance testing found the reduction in the number of collisions to be significant in that it was unlikely to have occurred without the scheme[1].

3.19. Although the saving in all collision types is clear, the impact on the severity is less so, as shown by Table 3-2.

Table 3-2 Severity of Collisions in Study Area

	Before	After	Difference
Severity index (proportion of all injury collisions which are fatal or serious)	13%	16%	+3%

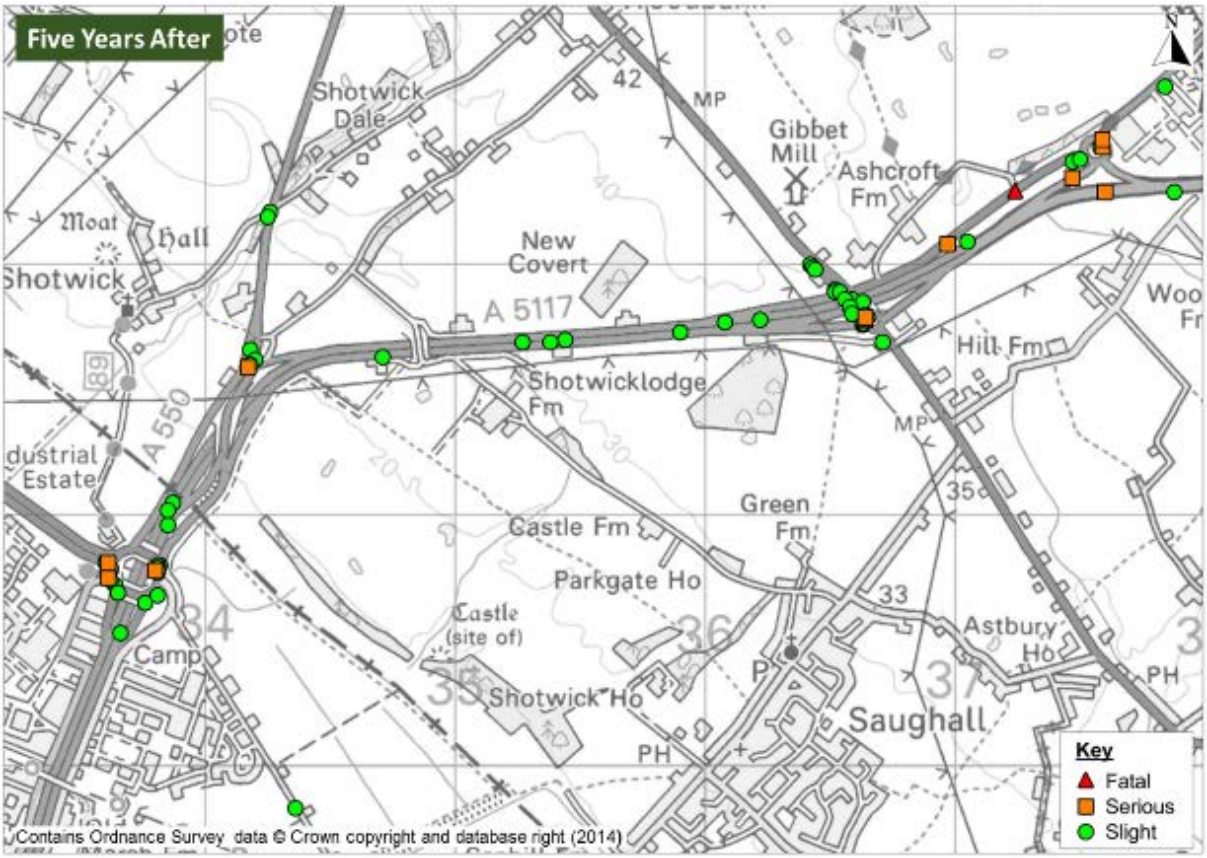
3.20. This shows that the severity index has worsened slightly. This is because the sharp decline in collision numbers has been greater for slight collisions, as seen in Figure 3-3. The number of fatal and serious collisions are relatively small so this change is not statistically significant and it should be noted that there have been no fatal collisions since 2010.

Locations of the collisions

3.21. The locations of the collisions included in Figure 3-3 are mapped for the before construction and the post opening period in Figure 3.4. Note that these maps use the background mapping representing the road layout at that time.

[1] The statistical significance test known as a Chi-square test used for the study area. This test uses the without scheme counterfactual and post opening collision numbers to establish whether changes are significant and attributable to the scheme or are likely to have occurred by chance. The results found that the reduction in collisions is statistically significant at the 95% and 99% level, hence it is unlikely to be have occurred without the opening of the scheme.

Figure 3.4 Collision Locations for before and after scheme opening



3.22. The distribution of the locations of collision locations in the before and after periods in Figure 3.4 shows:

- Overall, there are noticeably fewer collisions across the mapped area.
- Woodbank junction (A550/A494 - A5117) in particular had a large collision cluster in the five years before this scheme was built, including many which were serious. The new layout at this location provides free-flow in both directions between the A5117 and A484 and this has clearly improved the safety here.
- At the location of the new underpass and slip roads (A540 junction), the overall number of collisions has reduced, suggesting safety has improved as a result of the relocation of the main line to north of the existing road in an underpass below the A450 Parkgate Road. However, a collision cluster remains following scheme opening and the addition of the A494 (former A5117)/A540 junction could be a contributory factor.

3.23. It was not possible to obtain the Road Safety Audit for this scheme to throw further light on safety issues.

Collision Rates

3.24. The number of collisions along a length of road in conjunction with its AADT can be used to calculate a collision rate (calculated as the number of collisions per million vehicle kilometres travelled). By looking at the rate it is possible to identify the safety impact on the roads of interest whilst ignoring the impact of the change in traffic volumes.

3.25. These rates are compared with the forecasts for the same links and junctions. The forecast collision impact in the COBA model includes a predicted collision reduction over time. The before counterfactual rate as shown below is based on the observed national reduction in collisions on 'A' Roads from the Department for Transport national data between the before and after time periods as detailed in Section 3.3.

Table 3-3 Collision rate on A5117/A494 within the scheme

Period	PIC/mvkm
Before scheme opening - observed	0.402
Before scheme opening – counterfactual for the same period as the after data	0.302
After scheme opening	0.128
Difference between before (counterfactual) and after scheme opening	-0.174 (-58%)

3.26. The results show that the collision rate has decreased by 0.174 PICs/mvkm (58%) when compared to the before scheme opening counterfactual rate. This collision saving has been shown to be statistically significant.

Forecast vs Outturn Collision Savings

3.27. Table 3.4 compares the forecast collision saving and observed collision saving for the key links which covers the study area and excludes non-strategic roads. The results show that the COBA model forecast a collision saving of 9.7 in the opening year on these links, however, observed data shows the scheme has delivered collision savings 41% higher than forecast, saving 13.6 collisions per annum since opening.

Table 3.4 Forecast saving vs observed saving on the key links

	Collision saving (PICs)
Forecast opening year saving	9.7
Observed collision saving (annual average in first 5 years)	13.6
% Difference	+41%

Fatalities and Weighted Injuries

3.28. The collision rate discussed previously and shown in Table 3-3 does not take into account the severity of collisions. To analyse this, the Fatalities and Weighted Injuries (FWI) metric which is a combined measure of casualties based on the number of fatal, serious and slight casualties is presented. The FWI for the five years before and five years after periods are shown in Table 3-5. To take into account the increased traffic on the A5117 and for comparison with other schemes, billion vehicle kilometres (bvkm) are also presented. It should however be noted that these figures do not take account for background reductions in casualties or collisions.

Table 3-5 Fatality Weighted Index (FWI)

Period	FWI/collision	FWI/year	FWI/bvkm
Before	0.036	1.29	14.3
After	0.046	0.61	5.9

3.29. This shows that despite the increase in traffic on the A5117 in the post opening period, the FWI/bvkm shows that the seriousness of collisions has reduced.

Security

3.30. The aim of this sub-objective is to reflect both changes in security and the likely number of users affected. In terms of roads, security includes the perception of risk from personal injury, damage to or theft of vehicles, and theft of property from individuals or from vehicles.

3.31. The scheme appraisal did not forecast an impact on security, however, according to WebTAG Guidance 3.4.2, ‘road users are more vulnerable to crime at locations where they are required to stop their vehicles or travel at slow speeds, such as at the approaches to signals or in congested conditions’.

3.32. As per the assessment at OYA, the reduced queuing at several junctions will have decreased the potential for the crime detailed in the guidance explained above, however, in this rural scenario it is unlikely to be a major consideration. As such, the impact of the scheme on this sub-objective is slight beneficial, as expected.

Key Points - Safety

Collisions

- Collision numbers in the study area have reduced post-opening by 49%, an annual saving of 14. This reduction has included the national trend of background reduction and is statistically significant hence is attributed the scheme.
- Woodbank junction which is now mainly grade-separated, has seen the greatest improvement due to a reduction in vehicle conflicts.
- The collision rate on the A494 (formerly A5117), which takes into account the extra traffic on this route, has decreased by a significant 58%.
- Collisions which are classed as slight have reduced at a greater rate than the much smaller number of serious and fatal ones, so the overall severity index is now 16%, an increase compared to pre scheme level of 13%.
- The COBA model forecast a collision saving of 9.7 PICs/annum, however, the observed collision saving is 13.6 PICs/annum, which is 41% higher than forecast.

Security

- Personal security has been improved by fact that more vehicles can travel straight through the junctions without stopping in queues, where drivers are potentially at risk of crime.

4. Economic Impacts

Introduction

4.1. This section presents an evaluation of how the scheme is performing against the DfT's economy objective, which is defined in WebTAG as:

4.2. To support sustainable economic activity and get good value for money

4.3. The five sub-objectives for economy are to:

- Get good value for money in relation to impacts on public accounts;
- Improve transport economic efficiency for business users and transport providers;
- Improve transport economic efficiency for consumer users;
- Improve reliability; and
- Provide beneficial wider economic impacts.

4.4. When a scheme is appraised, an economic assessment is used to determine the scheme's value for money. This assessment is based on an estimation of costs and benefits from different sources:

- Transport Economic Efficiency (TEE) benefits (savings related to travel times, vehicle operating costs and user charges);
- Collision costs (savings related to numbers and severity level of collisions);
- Costs to users due to construction and maintenance; and
- Costs to public accounts of construction and impact on indirect taxation.

4.5. This section provides a comparison between the outturn costs and benefits and the forecast economic impact, as well as evaluating reliability and the scheme's wider economic impacts.

Scheme costs

Introduction

4.6. This section compares the forecast costs of the scheme as of the start of the construction period with the actual spend at the time of this study.

4.7. Costs of the scheme are also considered for the full appraisal period of 60 years such that they can be compared with the benefits over the same period. The full costs examined were made up of the following:

- Investment costs : before and during construction;
- Operating costs during the 60 years after opening; and
- Impact on Indirect Tax revenues: during the 60 years after opening.

4.8. Investment costs are considered in terms of a common price base of 2002 for comparison with forecast. For comparison with the benefits, overall costs are expressed in terms of present value, termed Present Value Cost (PVC).

Investment Costs

4.9. The investment cost is the cost to Highways England of the following:

- costs of construction;

- land and property costs;
- preparation and supervision costs; and
- Allowance for risk and optimism bias.

4.10. The outturn investment costs as of November 2014 for building the scheme have been obtained from the Regional Finance Manager at Highways England and approved by Highways England scheme Project Manager for the purposes of this study.

4.11. The forecast scheme costs are taken from the revised budget of September 2006, at the start of scheme construction and was been confirmed by the Programme Services Group.

4.12. The outturn spend profile for this scheme has been obtained for the purpose of this study and covers the period 2002 – 2014. For the purpose of comparison between forecast and actual, and with other major schemes, prices have been converted to 2002 prices. This figure can then be compared with the forecast cost on a comparable basis. These figures are shown below in Table 4-1, alongside the latest outturn scheme costs.

Table 4-1 Scheme Costs (£m)

Forecast Cost		Outturn Cost (as of Nov. 2014)		% difference
Approved budget at start of works	£51.4m	As spent costs in 2004 - 2014 years and prices	£61.0m	
Cost in £million 2002 prices, undiscounted	£43.8m	Cost in £million 2002 prices, undiscounted	£51.7m	18%

4.13. The cost included £4.1m from the Welsh Assembly Government and funding from the European Union through TEN-T network [1].

4.14. Table 4-1 shows that the scheme was 18% over budget. This increase was recognised during the construction phase was attributed to various factors including:

- Difficult weather conditions, particularly the exceptionally wet summer of 2007;
- Problems associated with works by the Statutory Undertakers, namely a major gas main diversion and
- Increased compensation events.

Present Value Costs (PVC)

4.15. Cost benefit analysis of a major scheme requires all the costs to be considered for the whole of the appraisal period and they need to be expressed on a like-for-like basis with the benefits. This basis is termed Present Value. Present Value is the value today of an amount of money in the future. In cost-benefit analysis, values in differing years are converted to a standard base year by the process of discounting giving a present value.

4.16. Following current Treasury Green Book guidance, calculation of the present value entails the conversion to market prices, then discounting by year. This using a rate of 3.5% for the first 30 years and 3% thereafter.

[1] Trans-European Transport Network (TEN-T) are the key transport corridors in the EU transport policy.

4.17. The full PVC for this scheme was forecast by the TUBA model is made up of the following costs converted to present value:

- Investment costs, as above; and
- Impact on Indirect Tax revenues during the lifetime of the scheme.

Indirect Tax - present value cost

4.18. Indirect tax revenue impact in the context of scheme appraisal means the changes to the revenue raised by central Government. For highways schemes this primarily means the revenue from fuel duty for all users and, for consumers, from VAT which will change if the scheme impacts the amount of fuel used by road users. Fuel usage changes are from the following:

- Changes in speeds which mean that vehicle are travelling at a greater or worse fuel efficiency;
- Changes to the amount of traffic; and
- Change to the journey lengths.

4.19. In the case of this scheme, the indirect tax revenue change is a positive cost, which means that less tax will be collected which means that the cost to the Government (PVC) is increased. This is in contrast to the situation for many other major road schemes. The reason is explained in the EAR as being due to the reassignment of traffic over the wide area included in the model network, in particular that of east-west strategic traffic from A55 including the Chester Southern Bypass, to use the shorter route from the M56 to the A55 in Wales via the scheme, leading to a reduction in fuel use, and hence to a reduction in fuel duty and VAT paid. As the forecasts do not quantify the level of traffic reassignment or the economic impact of this, it has not been possible to evaluate the comparable impact based on observed data, so it has been necessary to assume it is as forecast.

4.20. Table 4-2 shows the total of the present value costs, both with and without the indirect tax element.

Table 4-2 Summary of Present Value Costs (£m)

Costs in £m 2002 market prices, discounted	Forecast	Outturn
Investment cost	£45.1m	£56.8m
Indirect Tax impact as cost	£20.4m	£20.4m
Total PVC (including indirect tax)	£65.5m	£77.2m

4.21. These values for the costs are used in the calculation of the Benefit Cost Ratio in Table 4-8.

Economic Benefits

4.22. The appraisal of this scheme considered the economic benefits of this scheme expressed in terms of present value (present value benefits, PVB) for the aspects set out in Table 4-3. This table also sets out the approach taken in this post opening evaluation to the reforecasting based on the observed data at this stage, and those which have not been evaluated and have been assumed as forecast. A green tick indicates that the element of

benefits is considered as part of this evaluation. A red cross indicates that the forecast impact from the appraisal will be used in place of a full evaluation at this stage.

Table 4-3 Economic Impacts of Scheme

Costs in £m 2002 market prices, discounted	Forecast	Evaluate ?	Evaluation
Journey Time saving	937.1	✓	Represents a considerable proportion of the overall scheme benefits Outturn journey time impacts in opening year can be calculated form observed data and forecasts.
Safety	3.5	✓	Evaluated using POPE methodology, as the saving is significant
Vehicle Operating Costs		×	
Delay during construction period and future maintenance periods	-13.3	×	Evaluation is outside of the realms of POPE, therefore outturn is assumed as forecast.
Indirect tax revenue impact treated as a benefit	-20.4	×	Assume as forecast as this is primarily based on rerouting traffic which has not been measured
Total including indirect tax	906.9		

4.23. The economic benefits of this scheme were first assessed using COBA and QUADRO (Queues and Delays at Roadworks) for the area around the scheme. When a wider area traffic model was developed subsequently, TUBA (Transport Users Benefit Appraisal) 1.6 software was used to appraise the benefits. Safety benefits which are not modelled in TUBA were appraised based on the COBA model and manual calculations which extrapolated over the wider area.

Transport Economic Efficiency (TEE)

Forecast of TEE Benefits

4.24. The TEE benefits for this scheme were forecast using TUBA over the wide area SATURN traffic model shown in Figure 2-1. The EAR states that the majority of the economic benefits for road users are from savings in travel time and this is due to the removal of junction delays for A5117 through traffic.

Evaluation of TEE Journey Time Benefits

4.25. Journey time benefits have been evaluated based on the vehicle hours saving for the traffic using the A5117/A494. Although this does not cover the same wide network as used in the TUBA model, this is where the majority of the benefits are expected to occur. Vehicle hours savings have been evaluated based on the observed data as described in the traffic chapter for flows and for journey times.

4.26. The time saving on this route at five year after opening has been calculated as an annual total of 343,876 vehicle hours. The derivation of a 60-year monetary benefit has been undertaken using the Project Appraisal Report (PAR 5.0) guidance, and is the method used

in POPE for schemes that were appraised by TUBA. The capitalisation factor is that for NRTF traffic growth, adjusted by the ratio of the TEMPRO factor for Cheshire and that for Great Britain.

Table 4-4 Outturn FYA Journey Time Savings Benefits

Calculation of Present Value Benefits	Forecast (central growth, wide area)
Vehicle Hours Saved in year 5	343,876
Value Of Time per hour at 2002 prices	£12.86
60-Year Capitalisation Factor	49.94
Re-forecast of Value of Time Benefits 60 years, discounted to 2002	£173.6m

4.27. The total time benefit derived from this method is approximately £173.6million. Although substantial (as can be seen later in the comparison with the costs), this benefit is less than predicted value in the central case, which was £937.1 million. The reason for this difference is that the forecast was based on an extensive modelled network, in which reassignment was predicted, whereas the POPE evaluation of the outturn is confined to the scheme corridor, and gives a minimum figure. Unfortunately a like-for-like evaluation of the same basis as the appraisal was not possible because the TUBA modelling was based on a wide area extending from Flint to Ellesmere Port as shown in Figure 2-1. It is not possible to determine from a TUBA model what areas the benefits are derived from so it is unknown what proportion of the £937m is derived from the A5117 corridor.

4.28. The forecast and the outturn comparison is shown in Table 4-5.

Table 4-5 Forecast and Outturn FYA Evaluated Journey Time Savings Benefits

Present Value Benefits (£m 2002 prices, discounted)	Forecast (central growth, wide area)
TUBA forecast – Central growth – based on wide area (covering the area between Flint, Mold, Chester and Ellesmere port and parts of the Wirral and rural Cheshire east of Chester)	£937.1m
POPE re-forecast of benefits – based on observed impact in A5117 corridor only	£173.6m

4.29. This evaluation shows that, as reported at OYA, the outturn benefit is lower than that forecast and this is due to being based on a narrower area and thus provides a conservative estimate of the benefits based on those which can most clearly be linked to the scheme and the fact that as noted in the traffic chapter, traffic flows are lower than predicted.

Monetised Safety Benefits

4.30. The original forecasting of safety benefit was carried out with a COBA model, and as described in chapter 3 above; the predicted saving for the opening year was 9.7 PICs in the central case. The EAR stated that the level of saving for the corridor alone was £3.5million.

4.31. The POPE methodology for evaluating safety benefit, is based on the difference between the forecast and observed number of collisions, the PAR method for monetising injury collisions, and the forecast 60 year monetary savings. How these combine to produce and outturn monetary benefit is set out in Table 4.3.

Table 4-6 Predicted and Outturn Collision Saving and Monetary Benefit (£million 60 years)

Costs in £m 2002 market prices, discounted	Forecast		Outturn
COBA forecast opening year saving– central case	9.7	Observed annual average saving in first 5 years	14.0
		Net difference from forecast	3.9
Monetary benefit (from EAR)	£3.5m	PAR based monetisation of net difference	£14.8m
		Total safety PVB	£18.3m

4.32. This shows that due to the better than forecast (even taking into account the background reduction in collisions), the outturn re-forecast is above the forecast at £18.3m.

Impact of Construction and Maintenance Delay

4.33. The EAR included forecast of the monetary impact of the construction period and future maintenance periods as modelled by QUADRO. The forecast was for a small benefit for reduced delay during future maintenance periods but a much larger disbenefit during the construction period. The net impact was £13.3m disbenefit. The evaluation of the delays during the construction period is outside of the remit of POPE, hence the impact will be presumed to be as expected.

Summary of Monetised Benefits

4.34. The total present value benefits based on the results presented here are shown in Table 4-7.

Table 4-7 Summary of Present Value Benefits (£m)

Costs in £m 2002 market prices, discounted	Forecast	Outturn
Journey Time saving	937.1	173.6
Safety	3.5	18.3
Delay during construction period and future maintenance periods	-13.3	-13.3
Total	927.3	178.6
Indirect tax revenue impact treated as a benefit	-20.4	-20.4
Total including indirect tax	906.9	158.2

4.35. These values for the costs are used in the calculation of the Benefit Cost Ratio (BCR) in Table 4-8.

Benefit Cost Ratio

4.36. The BCR is an indicator used in the cost-benefit analysis of a road scheme that attempts to summarize the overall value for money of a project or proposal. The BCR is the ratio of the benefits of a project or proposal, expressed in monetary terms, relative to its costs, also expressed in monetary terms. All benefits and costs are expressed in present values as detailed in the above sub-sections.

4.37. Table 4-8 shows the calculation of the BCR using the costs and benefits presented earlier in Table 4-2 and Table 4-7 The assessment of the BCR is shown when the Indirect tax impact is treated as part of the costs, as in the original appraisal and the alternative within the benefits, in line with current guidance.

Table 4-8 Benefit Cost Ratio (BCR)

BCR Based on 60 years appraisal period and central growth		Forecast (includes TEE benefits from wide area)	Outturn evaluation (conservative assessment)
Indirect tax revenue as impact on costs (as appraisal approach)	Present Value Benefits	£927.3m	£178.6m
	Present Value Costs	£65.5m	£77.2m
	Benefit Cost Ratio	14.2	2.3
Indirect tax as impact on benefits	Present Value Benefits	£906.9m	£158.2m
	Present Value Costs	£45.1m	£56.8m
	Benefit Cost Ratio	20.1	2.8

4.38. The key points regarding the results from the evaluation of the BCR are:

- The outturn BCR assessments are over both over 2 representing over £2 of benefits for every £1 spend which is considered as high value for money according to the DfT criteria.
- Whether the indirect impact is part of the costs or benefits, the BCR shows that the scheme is value for money although, as the indirect impact is beneficial to the Treasury, the BCR is higher when this is part of the benefits rather than the benefits.
- The outturn BCR is much lower than the very high forecast BCR partly due to the higher than expected costs, but primarily because the original forecasts included modelled benefits over a very wide area whereas the outturn gives a conservative assessment based on benefits most confidently attributed to the scheme.

4.39. It should be noted that the BCR ignores non-monetised impacts. In the former NATA assessment used at the time this scheme was appraised, and its current replacement, the Transport Business Case, the impacts on wider objectives must be assessed but are not monetised. The evaluation of the environmental, accessibility and integration objectives is covered in the following sections.

Wider Economic Impacts

4.40. The AST stated that as a result of the scheme, up to 25,719 more jobs would be made accessible in a regeneration area, and that employment in deprived wards would increase in the range of 141 to 703 new jobs.

4.41. No detail on the basis of these forecasts was included in the appraisal documents of this scheme. It is now normal for Highways England major schemes such as this to have an Economic Impact Assessment and this would have strengthened the case for the scheme.

4.42. As in the OYA assessment, POPE has not attempted to quantify the job creation outcomes. A beneficial impact on the economy of Flintshire will have been achieved through the reduced journey times and improved reliability on this route. Areas close to the western end of these scheme include some of the 10% and 20% of the most deprived in Wales[1].

Key Points - Economy

Costs

- The investment cost of the scheme was £51.7million in 2002 prices. This was 18% above that estimated due to a number of reasons including problems with the statutory undertakers' work for a major gas main.

Benefits

- The journey time benefits are evaluated as £173.6 million over 60 years over the local area only. This represents a conservative assessment of the benefits and is hence much lower than forecast which covered a much wider area and included the impacts of strategic rerouting.
- The monetary benefits of the savings in the number of injury collisions is evaluated as £18.3 million over 60 years, higher than forecast despite including the impact of background reduction in collisions over this period.

Benefit Cost Ratio

- The outturn evaluation of the BCR is 2.8.
- The outturn BCR assessments are over 2 representing over £2 of benefits for every £1 spend which is considered as high value for money.
- Whether the indirect impact is part of the costs or benefits, the BCR shows that the scheme is value for money although, as the indirect impact is beneficial to the Treasury, the BCR is higher when this is part of the benefits rather than the benefits.
- The outturn BCR is much lower than the very high forecast BCR partly due to the higher than expected costs, but primarily because the original forecasts included modelled benefits over a very wide area whereas the outturn gives a conservative assessment based on benefits most confidently attributable to the scheme.

Wider Economic Impact

- Regeneration areas near the scheme in Wales should benefit from the improved connectivity through the reduced journey times and improved reliability.

[1] Flintshire Regeneration Strategy 2009-2020

5. Environmental Impacts

Introduction

5.1. The Environmental Statement stated that the scheme would:

- ***Minimise impact on people and property;***
- ***Minimise the impact on landscape character of the area;***
- ***Minimise impact on sensitive ecological areas; and***
- ***To provide a safe route for cyclists, pedestrians and horse riders along the length of the scheme***

5.2. This section documents the evaluation of the environmental sub-objectives, focussing on those aspects not fully evaluated at the One Year After (OYA) stage or where suggestions were made for further study.

5.3. The locations of key features of the scheme and locations of sites mentioned within this chapter is set out earlier in this report in Figure 1-3.

Summary of OYA Evaluation Recommendations

The OYA evaluation identified a number of areas where further analysis was required at the Five Years After (FYA) stage to confirm the longer term impacts of the scheme on the surrounding environment, these are summarised as follows:

Noise – A close boarded fence at Oakwood Farm was reported to have not been erected as proposed in the ES.

Landscape – The ongoing effectiveness of the planting in terms of screening and assimilation into the local landscape should be reconsidered as part of the FYA study.

Biodiversity – Planting and translocated areas were generally establishing satisfactorily at OYA, however some noxious weeds were noted during the POPE site visit. The longer term establishment should be reviewed at FYA, especially the areas of species-rich grassland. The OYA report noted that biodiversity should be reconsidered as part of the FYA study when further monitoring information should be available which would help inform on the effectiveness of the ecological mitigation measures for both habitats and species.

Water Quality – No water quality or discharge flow information had been available to POPE to confirm whether any improvements had occurred and it was suggested that water was reconsidered at FYA including re-consulting with the EA.

Journey Ambience – At OYA it was noted that there had been a small reduction in the number of accidents. However the actual benefit was less than predicted. As noted in the traffic evaluation section of this POPE report, 1 Year is too short a time period to form reliable conclusions and should be reviewed at the five year after stage.

5.4. The following environmental sub-objectives were appraised in the ES and in the Appraisal Assessment Table (AST) according to NATA guidance at that time (2008):

- Noise;

- Local Air Quality;
- Greenhouse Gases;
- Heritage;
- Landscape;
- Biodiversity;
- Water Environment;
- Physical fitness; and
- Journey Ambience.

5.5. For each of these environmental sub-objectives, the evaluation in this Section assesses the environmental impacts predicted in the scheme's AST and ES against those observed five years after opening.

5.6. In the context of the findings from the OYA evaluation and using new evidence collected five years after opening, this section presents:

- An evaluation of the ongoing effectiveness of the mitigation measures implemented as part of the scheme;
- An updated summary of key impacts against all of the nine environment WebTAG sub objectives, with particular focus on assessment of sub-objectives where it was too early to conclude at the OYA evaluation stage; and
- Additional analysis relevant to close out issues/ areas for further study as identified at the OYA stage for consideration at the FYA stage.

Methodology

5.7. This section focuses on those aspects not fully evaluated at OYA, or where at OYA, suggestions were made for further study and also any issues that have arisen since the OYA evaluation. The detail of the OYA study is not repeated here, and reference is made to the OYA report where required, although key points are incorporated into this FYA report where appropriate to provide contextual understanding.

5.8. No new modelling or survey work has been undertaken for this FYA environmental evaluation.

Data Collection

5.9. The following documents have been used in the compilation of this section of the report:

- A5117 Deeside Park Junctions Improvement Environmental Statement Volumes 1, 2 & 3 and Appendices (2005) and Non-Technical Summary;
- 'As Built' drawings;
- A5117 Deeside Park Junctions Improvement. Health & Safety File, Construction Environmental Management Plan, and Handover Environmental Management Plan;
- Archaeological Watching Brief for Carriageway Improvements around Deeside Park A5117, Chester, Cheshire. October 2006-October 2008 (January 2009);
- Non-Motorised Users Audit Report (March 2009);
- Natural England Badger Licences 2006 and 2007 and Great Crested Newt Licence Number EPSM2008-360 G.
- Information on Landscape Institute website for scheme

5.10. At OYA a draft Handover Environmental Management Plan (HEMP) was provided and it was anticipated that it would be completed in 2014 and provided to POPE as part of the FYA

evaluation. It is noted that this updated report has not been received for use in this evaluation.

5.11. A full list of the background information requested and received to help with the compilation of this chapter of the report is included in Appendix A.

Site Visit

5.12. As part of the FYA evaluation, a site visit was undertaken in July 2014. This included the taking of photographs to provide comparison views with selected ES photomontages and OYA photographs. These are shown in Appendix B.

Consultation

5.13. The Environment Agency), the Welsh Assembly Government, Natural Resources Wales, CADW, Cheshire West and Chester Council, Flintshire County Council and Mollington Lea-By Backford and Puddington & District Parish Councils

Table 5-1 Summary of Environmental Consultation Responses

Organisation	Field of Interest	OYA Comments	FYA Comments
Welsh Assembly Government (WAG)	Biodiversity (Licence Department)	Confirmation on licence application.	No response to consultation received
Natural England	Biodiversity & Landscape	Natural England felt unable to comment on landscape. In terms of biodiversity, it was able to provide GCN licence information although it was unable to provide any comments on the effectiveness of the mitigation.	Not consulted at FYA
English Heritage	Heritage	English Heritage felt unable to provide a detailed response however it did provide anecdotal comments in respect of the archaeological work and historic landscape character.	Not consulted at FYA
Environment Agency	Water	No response has been received from the Environment Agency.	No response to consultation received
Natural Resources Wales (formerly Countryside Council for Wales)	Biodiversity	Informal response was provided by the Countryside Council for Wales.	No response to consultation received
Cadw (historic environment service of the Welsh Assembly)	Heritage	No response has been received from Cadw	No response to consultation received
Cheshire West and Chester Council	General	Informal response received from the county ecologists regarding animal mortality. No response received with regards	No response to consultation received

Organisation	Field of Interest	OYA Comments	FYA Comments
		to all other matters.	
Flintshire County Council	General	Verbal response received in respect of local noise environment. No other responses received.	No response to consultation received
Parish Councils: - Mollington - Lea-By Backford - Puddington & District - Saughall and Shotwick Park	General	No response received from any of the four Parish Councils.	No response to consultation received

5.14. Highways England Area 10 Managing Agent Contractor (MAC) has also been consulted with regard to animal mortality figures. Figures provided by the MAC commence from 2012 when the contract was awarded to the present contractor. The figures provided do not include any animal mortality for the A494. Based on the response to animal mortality in the OYA report, where no protected species were noted, the FYA response agrees with this.

Traffic Forecast Evaluation

5.15. Three of the environmental sub-objectives (noise, local air quality and greenhouse gases) are directly related to traffic flows. No new environmental surveys are undertaken for POPE, and an assumption is made that if traffic is as expected then it is likely that local noise and air quality are as expected. Traffic levels tend to be a good indicator of noise and air quality measures.

5.16. The ES did not contain the detail of the traffic forecasts which were used as the basis for the assessment of the noise and air quality impacts. As the Traffic Forecasting Report was completed at the same time as the ES there is a reasonable assumption that the environmental assessments were made using the same figures, therefore the traffic flow data from the Traffic Forecasting Report has been used in this evaluation to compare the predicted figures against the actual FYA figures.

5.17. Table 5-2 compares the forecast traffic flows against the observed flows in 2014 which shows that traffic flows are lower than expected except for the A494 near Deeside Park junction. No change in the speed classification of the road has occurred. No comparative information is available in terms of speed as data for different classes of vehicles are not available nor directly comparable traffic counts.

Table 5-2 Forecast vs. Actual Traffic Volumes

Location	AADT		
	Forecast DS Interpolated 2014	Observed With scheme 2014	%
A5117,W of A540, Saughall	55,100	47,200	-14%
A494 Queensferry	67,500	69,500	3%

Location	AADT		
	Forecast DS Interpolated 2014	Observed With scheme 2014	%
A550, N of A5117	25,800	22,000	-15%

FYA Evaluation

5.18. Included in this section is a brief summary of statements from the AST, ES and OYA evaluations (including close out / key issues identified for further reporting at the FYA stage) which have been included to provide the context for the FYA evaluation.

Noise

Forecast

AST

5.19. The AST stated that a comparison between the Do Something and Do Minimum scenarios for 2022 showed a balance between adverse effects and benefits. Most changes were assessed to be marginal with an overall assessment of 0.3 population annoyed by the Do Something scenario in 2022.

Environmental Statement

5.20. The ES stated that a long term comparison (for the year 2022, 15 years after opening), with and without the road improvement, showed a balance between adverse effects and benefits. Baseline surveys[1] undertaken for the ES indicated that some properties close to the exiting road already experienced relatively high levels of traffic noise (over 70dB(A)).

5.21. The results of the ES noise assessment indicated that 5 houses could potentially be eligible for noise insulation under the Noise Insulation Regulations 1975 and that a further assessment would be carried out in advance of construction,

5.22. Proposed mitigation measures would include the construction of four earth mounds. Also, subject to agreement with the landowner, a 2m high close board fence would be provided at Oakwood Farm.

OYA Conclusions

5.23. The OYA report noted that noise mounding had been constructed in the locations and to the heights expected in the ES. Close board fencing at Oakwood Farm had not been erected as proposed within the ES and it was noted that the property appeared to not be occupied.

5.24. It was noted that noise fencing, 3m in height, had been erected to the boundary of the residential properties of Stansfield and that it was not anticipated in the ES assessment. It was noted at the time that it was erected to minimise disruption at Stansfield during construction.

5.25. The OYA report stated that low noise surface has been provided as a part of the scheme and that based on the specification documents provided to POPE satisfied the performance

[1] The CTRN survey area extended 300m from the existing road.

requirements for the Road Surface Influence (RSI) value of at least -3.dB(A). It was also noted that no properties had been eligible for noise insulation as a result of the scheme.

5.26. Based on traffic flow comparisons it was likely that overall the impacts on the noise environment were largely as expected at OYA.

FYA Consultation

5.27. No response to consultation has been received by POPE.

FYA Evaluation

5.28. Although FYA observed traffic flows are lower than predicted, they are within 20% of forecast and based on POPE methodology noise remains as expected at FYA.

5.29. A noise barrier noted to be installed to minimise disturbance during construction, is confirmed at FYA to still be in place. The screen planting and graded slope in place on the property side of the barrier are discussed in the Landscape section of this chapter.

Figure 5-1 Noise barrier adjacent to Stansfield properties

5.30. With regard to the possibility of fencing by agreement being provided at Oakwood Farm, at FYA it is noted that the property affected appeared to have been recently refurbished and a close boarded fence had been erected as shown in Figure 5-2.

Figure 5-2 Close board fencing on the boundary of an Oakwood Farm property

View looking south east towards the A540 junction

View looking north west from the PRoW adjacent to the junction

Table 5-3 Evaluation Summary: Noise

Sub-	AST	FYA

Objective		
Noise	Population annoyed Do Minimum 22.9 Population annoyed Do Something 23.2	As expected

Local Air Quality

Forecast

AST

5.31. The AST stated that in overall terms, the levels of air pollutants at properties would reduce with the scheme. Adverse effects for some properties would be outweighed by improvements at others.

Environmental Statement

5.32. The ES concluded that there would be increases in pollutant concentrations at some properties with the greatest increases occurring at the properties near the A5117/A540 junction, as a result of traffic increases and road realignment of the A5117 carriageway. However, there were not expected to be any exceedances of Air Quality Strategy (AQS) objectives with or without the junction improvements, and the scheme was not expected to have an impact on any existing or potential Air Quality Management Areas (AQMAs). The scheme was considered to have an insignificant impact on air quality. Specific mitigation measures for Local Air Quality were not proposed.

OYA Conclusions

5.33. The OYA report stated that it was likely that local air quality was as expected at three locations and three would be better than expected. Overall traffic had moved nearer to some properties and further away from others as expected. Along the A494 (former A5117) the OYA stated that there were fewer HGVs after the scheme than before, and that this was also below the forecast total. There were no other comparisons available for other roads.

5.34. The OYA report concluded that the air quality assessment demonstrated that none of the air quality receptors would have concentrations above the air quality criteria, with lower than expected traffic flows and overall HGV numbers, there would be no concern that pollutant concentrations would exceed criteria.

FYA Consultation

5.35. No response to consultation has been received.

FYA Evaluation

5.36. At FYA, the traffic flows provided in Table 5-4 show that observed flows are lower than those predicted (more than 1000 AADT) in two locations and slightly higher in one location. In line with the POPE methodology, overall it is presumed that the impact of the scheme is better than expected for air quality.

Table 5-4 Evaluation Summary: Local Air Quality

Sub-Objective	AST	FYA
Local Air Quality	PM_{10} Assessment Score: -283.8 NO_2 Assessment Score: -265.3	Better than expected

Greenhouse Gases

AST and ES Forecast

5.37. The AST assessment of greenhouse gases stated that there would be an increase of 2503 tonnes of CO_2 (which is 683 tonnes of carbon) in the opening year of 2007 due to a predicted increase in vehicle flows and speeds. This forecast matches that given in the ES which gave the 2007 opening year emissions for the Do Minimum and Do Something scenarios for the section of road to be improved and the surrounding network, although the network covered was not specified.

5.38. The forecast figures, expressed in terms of tonnes of carbon are shown in Table 5-5.

Evaluation

5.39. The carbon impact has been evaluated using DMRB air quality spreadsheet. As the extent of the network used in the original forecast was not known, the evaluation has been based on the improved road only where clearly the biggest impacts would be expected and there is good data coverage. The results for the actual emissions are shown in Table 5-5.

Table 5-5 Tonnes of Carbon Emitted

	Predicted for road network surrounding and including the scheme (opening year 2007)	Outturn on A494 only (FYA 2014)
Do Minimum/Without Scheme	13,148	2,293
Do Something/With Scheme	13,831	2,842
Net change	+683 (5%)	+549 (24%)

5.40. The evaluation shows a net increase in carbon emissions from traffic on the scheme section which is roughly in line with the forecast over a larger area. The increase is due to higher traffic flows and average speeds with the scheme in place.

5.41. It is important to note that this increase in carbon emissions is localised to the scheme and nearby network. The appraisal of the wider area in the traffic and economic modelling predicted that additional traffic in this corridor would be caused by rerouting of strategic traffic away from the longer A55 route south of Chester. As the alternative route is longer, the overall impact of the scheme on fuel consumption was forecast to be a reduction in the wide area.

Landscape and Townscape

Forecast

AST

5.42. The AST stated that the landscape features and elements were typical of the locality. Adverse impacts would be due to the increased scale of three junctions, loss of vegetation and a new bridge at Lodge Lane. The effects would be limited due to the proposed planting and mounding, and because the existing road was already a major feature in the landscape. Overall the impact was assessed as **Slight Adverse**.

5.43. Townscape was stated to be not applicable to this scheme.

Environment Statement

5.44. The ES stated that there would be some additional impacts on landscape character as a result of the increased scale of the three existing junctions and the loss of existing trees and hedges. Some individual farms and residential properties, and dwellings at Shotwick and off Green Lane, would be adversely affected by views of the new road and associated elements.

5.45. Lighting was present along the existing road; however, the roadside lighting at the improved junctions would be located closer to some local receptors than before the scheme. It was considered that the use of cut-off lighting would partially mitigate these impacts.

5.46. Signage to be provided as part of the scheme would be visible from a number of receptors, but it was not expected that views of these elements would be significant in their own right. Signage throughout the scheme would be a maximum height of 5.5m. No gantries would be erected as part of the proposals.

5.47. An adverse visual impact was expected at Mill Cottages due to the proposed traffic lights at the A540 junction, although this was expected to reduce as a result of proposed planting on adjacent land at the junction. However, this planting was not carried out, following the Public Inquiry (PI) and the Planning Inspector's recommendation that the compulsory purchase of this land would not be in the public interest, even taking into consideration scheme impacts on Mill Cottages.

5.48. Overall, the ES assessed the effect of the scheme on landscape as **Slight Adverse**.

Mitigation

5.49. Proposed mitigation measures would include

- The creation of gateway features near to the border of England/Wales and the planting of woodland, shrubs and hedgerow throughout the scheme;
- The field side of mounds and embankments would be given shallow gradients (1 in 10) and be returned to agriculture to integrate them into the landscape character;
- Mounds to help screen views of the road from potential visual receptors including those within the village of Shotwick (located to the north of the scheme) would be created throughout the scheme. There would also be a series of more minor mounds between the various carriageways within the road layout;
- Planting at off-site locations.

5.50. The ES expected that once established, the landscape planting would reduce the visual impacts of the junction improvement works through the 'softening' of scheme elements and by breaking up of the scale of the scheme when viewed locally.

Changes since ES:

- Offsite planting provided in agreement with the landowners at Pleasant View Farm and at Stansfield, where a 3m high screen fence was also erected.
- Accommodation works including approximately 4.7km of hedgerows planted offsite in agreement with landowners.
- Proposed 3m offsite mound on the former petrol station site near the Deeside Park Junction was not constructed. However, a replacement mound has been created on land to the southwest of the scheme immediately adjacent to the Deeside Park junction on-slip. The contours of this mound were designed to form a plateau area to allow the planting of a wet woodland.

Figure 5-3 Wet woodland planting and pond between carriageways south east of Deeside Park junction (earth mound is visible to the right of the photograph)

OYA Conclusions

5.51. The OYA report confirmed that the extent of existing vegetation removal was in line with that expected in the ES apart from at one location near to the A550 link bridge where slightly more than expected had been removed.

5.52. The proposed gateway features had been implemented near to the border of England and Wales. Grass and weed species were beginning to establish within the areas of stone chippings and there had also been substantial plant and grassland failure. Unless maintained these gateway features would lose their definition and visual appeal.

5.53. The OYA report confirmed that the remainder of the scheme planting had been undertaken in line with the ES proposals and was generally establishing satisfactorily. Offsite planting had been carried out at two locations. The scheme was subject to ongoing aftercare and any plant failures would be replaced as part of the contract maintenance.

5.54. It was noted during the site visit that a 'mesh' type fabric had been attached to the post and rail highway boundary fencing in some locations. It was understood that this was a temporary measure to mitigate potential headlight glare on adjacent local roads whilst the scheme planting established.

5.55. Scheme lighting and signage had been implemented throughout the scheme as expected.

5.56. The majority of the proposed mounds had been constructed as expected. Although the mound at the Deeside Park junction was higher than expected it was seen against the existing artificial landform of the junction.

5.57. The ongoing effectiveness of the planting in terms of screening and assimilation into the local landscape should be reconsidered as part of the FYA study.

FYA Consultation

5.58. No responses were received.

FYA Evaluation

5.59. Comparison FYA views with selected ES photomontages and OYA photographs are shown in **Appendix B**.

Context

5.60. The scheme is situated in Green Belt and forms a dominant feature in the local landscape. The western end lies in the low lying plain of the Dee valley, typically only 5 metres above sea level. Approaching the A550 Woodbank junction, the landform rises up a gentle

escarpment which historically forms the old coastline before the Dee Estuary silted up. It continues to rise gently across the Cheshire Plain to the A540 Parkgate Rd Junction which is 40 metres above sea level. Between the A540 junction and the M56 the area remains relatively flat. The landscape of the Cheshire plain is open in character with large fields and well-maintained hedges and occasional blocks of woodland. A major electricity power line also forms a dominant feature in the landscape[1].

Aftercare Maintenance

5.61. The draft Handover Environment Management Plan (dHEMP) notes that a period of 5 years for aftercare of the landscape and ecological works was expected, which was later reduced to 3 years at Highways England request. The additional 2 years of establishment maintenance was to be covered by the Managing Agent Contractor (MAC) during the Handover and Initial maintenance period.[2]

5.62. It is understood from the dHEMP that apart from verges, which were maintained by the MAC following practical completion of the landscape works, all other grassland contained within the site area was only maintained for the duration of the contract aftercare period (3 years).

Progress of planting within the scheme

5.63. Based on the FYA site visit planting within the scheme appears to be growing well and, subject to on-going successful establishment and required maintenance, should integrate the A494 into the local landscape and screen traffic as expected. Planting on landscape mounds was progressing well indicating that sufficient soil preparation at the time of planting was undertaken. Localised plant failures appear to have been replaced, although the percentage is not provided in the dHEMP. Species-Rich Grassland areas, including those within pond boundaries, appear to be progressing well. It is noted, however, that noxious weed growth in grassland areas is not being controlled, probably due to the reduced aftercare on handover to the MAC.

Figure 5-4 Planting progress is generally good at FYA

[1] Extract from ES volume 1 sub section 2.2 The route and its settings
[2] Employers Requirements Section 6 Volume 2B Annexes, Volume 2 Works Information

Figure 5-5 Species-Rich Wetland grass near Dunkirk junction (including noxious weed growth)

5.64. The dHEMP states that to assist in achieving semi-ornamental planting around the main junctions of the scheme, areas of amenity grass were incorporated in select areas and regular, high frequency cutting was carried out during the aftercare / maintenance period to enhance the amenity value and aid in the establishment of an even sward. During the site visit it was noted that amenity grass planting, shrubs and trees appear well-developed and maintained within the Dunkirk and Parkgate Rd junctions' roundabouts (see Figure 5-6 and Figure 5-7).

Figure 5-6 Planting on Dunkirk Junction Roundabout

Figure 5-7 Planting on the Parkgate Rd Junction Roundabout

5.65. Hedgerows throughout the scheme appear to be growing satisfactorily, with some local failures between anti-dazzle screens located where contraflow traffic outside of the A494 occurs. This may impact on screening requirements should the hedge not fill out as required.

Figure 5-8 View of well-developed hedgerow from Cycleway / Access Road from Parkgate Rd Junction travelling west

Figure 5-9 Anti-dazzle Screen between A494 and new bridge east of Woodbank Junction (some localised failure of hedgerows is evident)

5.66. Standard tree planting throughout the scheme is generally growing satisfactorily as evidenced in Figure 5-10. Some stakes appear to be loose in the ground and providing no support. The draft HEMP states that biodegradable plant shelters were used which were expected to disintegrate by year 5 – this has yet to occur and should be undertaken manually to ensure good lower growth, especially for screening plants. No mention is made of the stakes for standard trees.

Figure 5-10 Standard Tree Planting at Woodbank Junction

5.67. The OYA report noted that a 'mesh' type fabric had been attached to the post and rail highway boundary fencing in some locations. During the FYA site visit, it was confirmed that the fabric is still place and may be limiting lower growth of the hedgerow defeating the purpose of the establishment of the screen planting.

Figure 5-11 Fabric screen still in place at FYA west of the Dunkirk Junction, adjacent to the multi-use path / access road

Gateway Features

5.68. The dHEMP stated that during consultations in November 2003, both Cheshire County Council and Flintshire County Council requested the inclusion of a suitable gateway feature to mark the national boundary. The dHEMP stated that *"the concept of creating the features along the lines of the white horse hill carvings of Wiltshire was considered as the ideal way to bring together all the requirements of the features. It was possible to achieve this concept by breaking down images of the traditional national symbols of the Dragon and the Lion into a series of simplified, flowing shapes*". Given the high profile of the feature it is essential to maintain its appearance and impact, with clean lines and light colour against the formal grass background.

5.69. The dHEMP notes that in order to ensure the features are maintained with clean lines and light colour against the formal grass background the maintenance requirements would include:

- Keeping the stone area free from weed, algal growth or any pollutant that might cause discoloration
- Keeping the stone area topped up to initial levels
- Preventing stone slipping out of shape onto the surrounding area
- Maintaining the growth of the surrounding grass at a low height to maintain a formal appearance.

5.70. It was reported at OYA that weeds were beginning to encroach within the gravel and during the FYA site visit it was noted that the Gateway features do not appear to have received recent maintenance to ensure the visibility and definition of the features is maintained (see Figure 5-12 and Figure 5-13).

Figure 5-12 FYA shrub replacement and lack of maintenance at England's 'Lion' feature

OYA view of 'Lion' feature

Figure 5-13 Wales' Dragon Feature at FYA

5.71. Screen planting and graded slope in place adjacent to Stansfield properties are shown in Figure 5-14. The planting along the introduced landscape mound is progressing well and is providing an improved level of screening for affected properties.

Figure 5-14 Landscape mound and planting adjacent to Stansfield properties

5.72. Based on the information presented, it is therefore concluded that the effects of the scheme on the landscape are **as expected**, although the lack of aftercare maintenance for the remaining two years after handover to the MAC, and as required in the Handover Data Schedules within the dHEMP appears to have been limited to visibility splays and amenity areas.

Sub-Objective	AST	FYA
Landscape and Visual	Slight adverse	As expected

Heritage of Historic Resources

Forecast

AST

5.73. The AST stated that no evidence of archaeological remains of national importance had been identified. However locally important sites included; Shotwick Medieval Deer Park, 2 historic routes and palaeo-environmental interest. Due to the proposed mitigation of preservation by record the effect would be neutral. No direct effects on built heritage were anticipated, with a benefit anticipated on the setting on Shotwick Conservation Area. It was considered that overall the Historic Landscape Character would not be compromised and the impact on heritage as a whole was assessed as **Neutral.**

Environmental Statement

5.74. The ES noted that locally important features included the village of Shotwick, a conservation area containing several listed buildings. It was anticipated that the proposed mounds would protect the setting of the conservation area.

5.75. It was expected that some impacts on field boundaries would occur but overall the Historic Landscape Character would not be compromised.

5.76. In terms of archaeological remains no sites of National Importance would be affected. However the following would potentially be affected by the scheme;

- Boundaries of the medieval deer park near Shotwick;
- Two historic routes (a saltway and possible Roman road); and

- Palaeo-environmental interest including the Dee Valley.

OYA Evaluation

5.77. The Archaeological Watching Brief report noted that there was no activity in the areas targeted along the A5117 carriageway prior to the post-medieval period. No significant archaeological features were discovered in the areas under scrutiny with only scattered post-medieval remains seen throughout. It is understood that the finds have been archived.

5.78. With regard to built heritage, the report noted that the setting of Shotwick Conservation Area was protected by screen mounding. There were some impacts on field boundaries but the overall historic landscape character had not been compromised

5.79. No significant archaeological features were found during the field survey or during the watching brief. Recording in situ/archiving was undertaken of all finds. Whilst there had been a change in the location of the earth mound near Deeside Park junction this had not affected the integrity of the mitigation and the impact on the setting of Shotwick Conservation Area and the Historic Landscape Character.

FYA Consultation

5.80. No response to consultation has been received.

FYA Evaluation

5.81. No further evaluation has been undertaken, as there are no unresolved issues from OYA and no changes regarding Heritage as a whole have been identified during the FYA site visit. It is therefore concluded that the effects of the scheme on the heritage resource are generally **as expected**.

Sub-Objective	AST	FYA
Heritage of Historic Resources	Neutral	As expected

Biodiversity

Forecast

AST

5.82. The AST stated that the biodiversity features were typical of the locality and that the proposals would be an online improvement in a highly agricultural area. Species diversity was low and no significant effects on sites designated for nature conservation were expected. The River Dee and Mersey Natura 2000 sites would not be affected. Some loss of great crested newt terrestrial habitat and also some loss of woodland and hedgerow was anticipated. It was considered that there was an opportunity to enrich the local ecology with habitat creation. Overall the impact was assessed as **Slight Adverse**.

Environment Statement

5.83. The ES stated that:

- Local sites designated for their Biological Importance (Shotwick Park Site of Biological Importance (SBI), Big Wood SBI, Old River Dee Escarpment SBI and Shotwick Dale

SBI) and the River Dee and Mersey Natura 2000 sites would not be directly affected by the proposed improvement scheme.

- There would be a loss of habitats including hedges (including part of an Important Hedgerow), meadows, a pond and an area of wet woodland.
- It was identified that land used by great crested newts (GCN) would be affected but no ponds containing GCN would be lost.
- No badger setts would be permanently lost, however a Natural England Licence would be applied for with regard to the potential disturbance to two setts and their temporary closure, if required.
- Birds and bats would not be directly affected by the proposals.
- No water voles or otter were identified in surveys undertaken as part of the baseline assessments.
- The ES noted that, after consultation with the Countryside Council for Wales and English Nature, no survey for white-clawed crayfish was required.
- No evidence of adult larvae, or egg cocoons was found during the survey work for lesser silver water beetle, however it was considered that the inclusion of suitable habitats could provide a potential for positive enhancement.

Mitigation

5.84. Mitigation measures were proposed for migrating birds, GCN, and badgers. Other measures would include the creation of wildflower meadows, new species-rich hedgerows, mixed woodland and the translocation of soils from a wet woodland.

5.85. Habitat creation measures for the lesser silver water beetle and the erection of bird and bat boxes, considered as a potential for positive enhancement, were also proposed.

OYA Conclusions

5.86. Native trees and shrubs were planted as part of the scheme, providing hedgerows and mixed woodland, including wet woodland.

5.87. Planting and translocated areas were generally establishing satisfactorily, however some noxious weeds were noted during the POPE site visit.

5.88. Scheme monitoring undertaken between 2007 and 2010 indicated that there had been no overall changes in the numbers of GCN although the report noted that further monitoring results were required before it would be possible to confirm whether there has been any long term impact. It was also stated that ponds within the mitigation area were dry or had experienced low water levels and this could be affecting the survival of efts[1]. Further surveys were expected in 2011, 2013 and 2016.

5.89. Badger populations had not been adversely affected by the scheme. A further survey was expected in 2011.

5.90. The scheme monitoring report stated that it was too early in the establishment of the planting for it to provide breeding habitat although the wetland area had provided suitable habitat for Plover.

[1] A newt lives in water for a few months before it loses its gills. It then lives on land for two to three years. In this middle stage of its life it is called an 'eft'. Finally in adulthood it returns to the water to breed and to live out the remainder of its life.

5.91. Bird and bat boxes had been erected in areas of existing woodland throughout the scheme. Bird boxes were not used in 2009 and the monitoring report recommended repositioning them higher up.

5.92. The OYA stated that Biodiversity should be reconsidered as part of the FYA study when further monitoring information should be available which would help inform on the effectiveness of the ecological mitigation measures for both habitats and species.

FYA Consultation

5.93. No response to consultation has been received.

FYA Evaluation

5.94. No updated monitoring reports for biodiversity were received by POPE for use in the FYA evaluation, including for Great Crested Newts (License reference - August 2006 DEFRA WLF 023362 dated 26 July 2006). The dHEMP states that annual monitoring surveys have been undertaken throughout the aftercare period, to all newly created ponds and those identified as GCN breeding ponds by the 2004 surveys. The dHEMP notes that this monitoring is required to continue in post-handover years 2013 and 2016.

Figure 5-15 Badger fencing within the scheme (no damage was noted as identified in the OYA report)

5.95. The dHEMP also notes that bats, and breeding / over-wintering birds were to be monitored during the aftercare period to assess the efficacy of the mitigation measures – no monitoring reports have been received by POPE to confirm this.

5.96. The POPE site visit confirmed that species-rich grassland (SRG), hedgerows and planting plots within the scheme are progressing well, although noxious weed growth appeared uncontrolled and may affect the progress of SRG.

5.97. Wildlife wetland habitats included 14 ponds designed in mitigation for protected species including GCN and lesser silver water beetle, whilst providing foraging for many other invertebrate, bird and mammal species.[1] No monitoring information on the translocated wet woodland soils has been received by POPE.

[1] Text from Landscape Institute website

5.98. Without the monitoring information it is not possible to evaluate the effect of the scheme for biodiversity in any detail. This is despite the conclusion that woodland and hedgerow habitat establishment within the site appears to be progressing well. A concern over the prevalence of noxious weeds within the species-rich grassland remains a concern and may impact negatively on the overall successful establishment of this important habitat. Consequently, no final assessment can be made for this FYA assessment.

Sub-Objective	AST	FYA
Biodiversity	Slight Adverse	No final assessment available

Water Quality and Drainage

Forecast

AST

5.99. The AST stated that the water features and elements were typical of the locality and there would be an improvement in the chemical water quality and a reduction in the peak flow within the watercourse regime, due to provision of sedimentation and attenuation ponds. Overall the impact was assessed as **Slight Beneficial**.

Environmental Statement

5.100. The ES stated that prior to the improvement scheme, run-off from the road (A5117) entered the existing system of ditches which eventually outfall into the River Dee and Dee Estuary. Spillage risk calculations undertaken as part of the ES confirmed that with the absence of pollution control measures, accidental spills could have an impact on the chemical water quality.

5.101. The ES considered that the proposed drainage ponds represented an improvement over the existing road drainage by reducing flood risk and providing better pollution control. Whilst one pond would be lost this would be mitigated by the creation of sedimentation and attenuation ponds throughout the scheme.

5.102. The minor stream located immediately to the south of West View Farm would be diverted and a culvert across the existing A5117 downstream of the ponds at Woodbank Junction would be required.

OYA Evaluation

5.103. The OYA report stated that two types of water body had been constructed as part of the scheme; pollution / attenuation ponds and wetland habitat areas. The pollution/attenuation ponds had also been designed as hybrid wetlands.

5.104. From ‘as built’ information it was confirmed that five clusters of drainage ponds had been incorporated into the scheme, comprising either a two or three pond system. The first pond in the cluster was designed to settle out heavy metals and floating oils with the final pond/s designed to attenuate the volume of flood water. It was noted that this pond also allowed the settlement of sediment clarifying the water further. The ponds were holding water at the time of the site visit and vegetation was establishing satisfactorily within the ponds.

5.105. Based on ‘as built’ information, it would appear that the diversion of the minor stream and culvert have been undertaken and that penstocks and permanent booms had been included at the ‘pond clusters’ as expected.

5.106. No water quality or discharge flow information had been available to POPE to confirm whether any improvements had occurred.

5.107. No water quality or discharge flow information had been available to POPE to confirm whether any improvements have occurred and it was suggested that water was reconsidered at FYA including re-consulting with EA.

FYA Consultation

5.108. No response to consultation was received.

FYA Evaluation

5.109. There are no major watercourses in the immediate area of the scheme, with drainage proposals including a system of sedimentation and attenuation ponds into which runoff from the road is channelled, and which enables pollutants to settle out before the water is discharged to local watercourses., and as expected in the ES this is considered to be an enhancement over the previous system of direct discharge to adjacent roadside ditches and minor watercourses. This reduces the potential pollution loading on the River Dee and the Dee Estuary. By discharging water at a Greenfield runoff rate the attenuations ponds also mitigate the risk of flooding of adjacent water courses.

5.110. The dHEMP notes that the scheme included the incorporation of 11 hybrid wetlands to provide drainage attenuation and treat runoff whilst enhancing biodiversity. Drainage mitigation for Great Crested Newts (GCN) includes the design of kerb-less drainage where possible, with mitigation designed into the kerb and drainage system where required to minimise the risk to GCN.[1]

5.111. In the course of the POPE site visit, all scheme ponds were viewed, and drainage channels and culverts were visited. All ponds were found to be operating as expected, although the pond south of the Deeside Park junction is possibly showing signs of blockage / siltation at its outlet. Vandalism of this pond is also noted as shown in Figure 5-18. It is unclear to POPE when this vandalism occurred and no information on frequency of maintenance inspections has been made available. Noxious weed growth is noted in some pond areas that has remained uncontrolled for some time.

Figure 5-16 Drainage channel along top of false cutting on offslip at Deeside Park Junction

[1] Text taken from Landscape Institute website

Figure 5-17 Observed impacts of Access culverts for drainage

appears to receive little water

siltation and water pooling is encouraging wetland plants

Figure 5-18 Pond south of Deeside Park junction – inset photographs show lifebuoy support has been vandalised and a build-up of water is evident at the outlet of the pond

Figure 5-19 Pond in between new slip roads at Deeside Park junction

Figure 5-20 Pond between Aston Road and Dunkirk junction eastbound offslip

5.112. In the table titled Environmental Management Monitoring, Inspection and Audit Register in the dHEMP, a requirement is confirmed for the monitoring of water quality at agreed locations to test quality against baseline measurements. No record of water quality monitoring has been made available to POPE and POPE is not aware whether any monitoring has been undertaken.

5.113. POPE Methodology requires the close out of any issues identified at OYA, desktop analysis and a site inspection focusing on the condition of the assets and system performance. Assessment of water quality data if received is a secondary requirement. As no water quality data has been received by POPE for this assessment, assessment of the effect of the scheme on water quality and drainage is based on the visible drainage features encountered during the POPE site visit. , Based on the POPE site visit, it is assumed that drainage functions are performing **as expected**.

Sub-Objective	AST	FYA
Water Quality and Drainage	Slight Beneficial	As expected

Physical Fitness

Forecast

AST

5.114. The AST stated that the new facilities along the A5117 for pedestrians and cyclists along with the improved crossing points would increase opportunities for exercise; however it was not possible to accurately forecast the numbers. The impact was assessed as **beneficial**.

Environmental Statement

5.115. The ES stated that pre-scheme facilities for pedestrians, cyclists and equestrians were either poor or non-existent. There was no continuous route along the scheme and crossing the road at the established crossing points was difficult and dangerous. Counts made as part of the assessment[1] added up to 21 cyclists, less than 10 pedestrians and no equestrians.

5.116. The ES noted that a new continuous route for pedestrians, cyclists and equestrians would be created along the scheme. There would also be an improvement in crossing points, including a bridge at Lodge Lane and 'Pegasus' crossings for the A550 at Woodbank and A540, which would improve safety and reduce severance for people seeking to cross the road. It was anticipated that conditions would also be improved at Parkgate Road with provision for pedestrians and cyclists across the bridge. Overall it was expected that the proposals would have a **slight positive** effect on Physical Fitness.

OYA Evaluation

5.117. The OYA report stated that a new continuous route for pedestrians, cyclists and equestrians was in place between Dunkirk Junction and Deeside Park junction as expected. During the site visit it was noted that Public Right of Way (PRoW) routes were clearly signed throughout the scheme.

5.118. Feedback in the NMU Report (which included the NMU Audit undertaken on the 22nd January 2009) was positive and it was considered that the scheme had achieved its objectives to provide an NMU link along the entire length of the scheme.

5.119. The NMU Audit did not include a count of the number of users. No additional NMU user surveys were undertaken for POPE, however it was noted during the site visit that the link route between the junctions of Deeside and Woodbank (A550) was well-used by cyclists. It was anticipated that the impacts on physical fitness were **as expected**.

5.120. The OYA stated the provision for cyclists, pedestrians and equestrians was better than before the scheme and the opportunities for physical exercise were also improved as expected.

FYA Evaluation

5.121. During the site, all PRoWs visited showed signs of use, including cyclists throughout and lunchtime pedestrians taking a break from the various offices located near Deeside Park junction. All PRoW appeared well maintained for ease of use. Improvements at the various crossing points over the A494 were in place as expected.

[1] Survey undertaken for a period of 12 hours in November 2003

Figure 5-21 Bridleway gated access through Pleasant View farm south of the A494

Figure 5-22 Use of PRoWs within the scheme

Figure 5-23 Woodbank junction showing multi-use access and Pegasus crossing

5.122. Based on the information presented in this evaluation, it is concluded that the effects of the scheme on physical fitness are likely to remain **as expected**.

Sub-Objective	AST	FYA
Physical Fitness	Beneficial	As expected

Journey Ambience

Forecast

AST

5.123. It was considered in the AST that the proposals would make the overall journey ambience better with increased interest in views from the road, less congestion reducing frustration and a reduced fear of accidents. The overall impact was assessed to be **large beneficial**.

Environmental Statement

5.124. The ES stated that the proposals would improve the overall journey ambience for vehicle travellers with a **large beneficial** impact expected.

5.125. The effects of the scheme were expected to be as follows;

Traveller Views

5.126. Planting would be designed to create attractive views from the road, including retaining open views and providing variety in the planting types, including the planting of ornamental shrubs at the key roundabouts.

5.127. The introduction of embankments, cuttings and environmental mounds would mean that views over the surrounding landscape would not be as open as before the improvement scheme changing the existing continuously open view into a series of viewing 'episodes'. A gateway feature near to the border of England and Wales would be constructed as part of the improvement scheme.

5.128. It was expected that there would be a balance between the change to certain long distance views, the loss of the direct connection with the landscape and the creation of new features of interest and that overall the views from the road would be better with the proposals.

Driver Stress

5.129. The ES stated that although the simple geometric layout of the existing main carriageway lent itself to easy navigation; it was considered that the existing junctions were not easy to navigate. The junctions caused driver frustration due to significant congestion and delays for travellers especially at peak times and holiday weekends.

5.130. The existing route was said to be well-signed, with direction signs at the approaches to all junctions. In terms of route uncertainty although the proposed route would be more complex, the signage and reduced congestion would balance the potential uncertainty.

5.131. The fear of collisions and the potential for conflicts with pedestrians were expected to improve due to the separate NMU routes proposed and improved crossing points.

Traveller Care

5.132. Existing facilities were limited to a Little Chef restaurant/café and adjacent petrol station to the south east of the existing A540/A5117 roundabout at the Parkgate Rd junction. No new facilities were proposed as part of the scheme and existing facilities were expected to stay.

5.133. New signage would be located throughout the scheme and no overall improvement or deterioration was anticipated.

OYA Evaluation

5.134. The OYA report confirmed that planting was designed to create attractive views from the road, including retaining open views as required in the ES. Areas of ornamental planting were located at 'destination points'. Gateway features were constructed near the border between England and Wales as expected.

5.135. The OYA report noted that it was understood that congestion had improved along the A494 (previously A5117) with through traffic free flowing at junctions as expected.

5.136. The fear of collisions and the potential for conflicts with pedestrians had improved due to the separation of NMU routes and improved crossing points. Improvements in NMU access routes and crossing points have been implemented as expected.

5.137. The OYA noted that congestion on the A494 (previously the A5117) had improved, driver views were as expected and the improvement in pedestrian crossing provision was expected to have reduced fear of collisions as expected.

FYA Consultation

5.138. No response to consultation was received.

FYA Evaluation

5.139. Table 5-6 summarises the evaluation of the various elements of journey ambience and the scheme's impact on this sub-objective. Overall the scheme impact is large beneficial as expected.

Table 5-6 Summary of Journey Ambience Evaluation

Traveller Factor		ES evaluation	FYA evaluation
Views		Better	Planting is progressing well and is expected, together with the introduced mounds, to create attractive views within the road and maintaining some open views when the road is not in cutting. The planting of ornamental shrubs at the key roundabouts is progressing well and is being maintained as required. The gateway features installed as a part of scheme are not as visible or well-maintained as expected.
Driver Stress	Frustration	Reduce	Free-flow through the junctions and reduced congestion should reduce driver frustration**.**
	Fear of Collisions	Better	The fear of collisions and the potential for conflicts with pedestrians have improved due to the separate NMU routes proposed and improved crossing points. Fear of collisions is also reduced by the free-flow movement of truck road traffic

Traveller Factor		ES evaluation	FYA evaluation
	Route Uncertainty	Neutral	Although the route is more complex than the previous one, the signage and reduced congestion balances uncertainty. New signage is located throughout the scheme and no overall improvement or deterioration is noted.
Care		Neutral	The existing facility of the restaurant/café and adjacent petrol station to the south east of the A494 roundabout is still in place as confirmed during the POPE site visit. No new facilities were proposed as part of the scheme and existing facilities were expected to stay.
Summary Score			The key contributors to the effect on Journey Ambience is the increase in views available from the road and the effect of less congestion reducing frustration, a reduced fear of collisions due to segregation of the main traffic flow and better and separated facilities for pedestrians, cycles and local traffic

Sub-Objective	AST	FYA
Journey Ambience	Large Beneficial	As expected

Key Points - Environment

Noise and Air Quality

- Observed traffic flows are lower than predicted potentially resulting in a local noise climate that is better than expected although methodology determines that the impact on noise remains as expected at FYA.
- Traffic flows are lower than those predicted (more than 1,000 AADT) resulting in a better than expected assessment for air quality.

Greenhouse Gases

- On the scheme, there was a net increase of 549 tonnes of carbon emissions in the fifth year after opening occurring on the scheme section itself due to higher speeds and traffic flows.

Landscape

- The road corridor generally remains free of noxious weeds, although there are isolated uncontrolled areas. Planting within the scheme is progressing well. Grassland areas are free of significant scrub cover, and plant stock is generally healthy, established, and in good condition.
- Planting plots have generally achieved their target coverage within the time period and the current levels of plant growth and establishment indicate that their visual screening and landscape integration functions are developing as expected at FYA. The gateway features however have not been maintained and at FYA are barely visible.
- Overall landscape impact is slight adverse as expected.

Biodiversity

- Monitoring results have not been provided for use in this an evaluation and as such an overall assessment cannot be provided although vegetative habitat establishment is developing in line with the ecological mitigation proposals as stated in the ES.

Heritage

- No significant archaeological finds were made during the original field study and at OYA is was noted that these had been archived/recorded in situ appropriately. At FYA, no further assessment was required.

Water

- No information has been made available to POPE which would indicate that the scheme drainage measures are performing other than as intended. Based on the FYA site visit and the as-built drawings, it is likely that the overall effect of the scheme on water quality and drainage has been beneficial as expected in the ES, however, water quality monitoring results would be required to confirm this.

Physical Fitness

- Mitigation measures have been implemented as expected and footpaths / cycleways viewed during the FYA site visit appeared well used and performing their functions as intended.

Journey Ambience

- A large beneficial impact due to the increased capacity of the improved route, relieving congestion and delays at junctions.

6. Accessibility and Integration

6.1. This section evaluates the impact of the scheme in terms of the accessibility and integration objectives; comparing qualitative forecast assessments from the scheme AST (as shown in Table 7-1) with post opening findings and analysis of policy objectives.

Sources

6.2. The sources used to inform this section are :

- AST
- Non-technical summary of the Environment statement
- Environment statement volume 2 (included accessibility and integration with policies)
- Public inquiry inspector's report
- Non-Motorised Users (NMUs) Audit (March 2009)

Accessibility

Option Values

Forecast

6.3. The AST stated that the sub-objective was not applicable for the A5117 Deeside Park Junction improvement scheme.

Evaluation

6.4. At OYA, it was noted that there was no change to public transport provision as part of the scheme although several local bus services used this route. Since then one of these services has been withdrawn, although there is no reason to connect this with changes the scheme, therefore the assessment at FYA is that this sub-objective is not applicable to this scheme.

Severance

Forecast

6.5. The AST scores the sub-objective as 'slight positive' and states:

'*Improved crossing points including a bridge at Lodge Lane would reduce severance for pedestrians, cyclists and equestrians. Public footpaths diverted to cross the highway would be longer but safer to use'.*

6.6. The ES also noted that the scheme would provide:

- Relief from severance by improving linkages to a range of community facilities both locally and regionally.
- Increased amenity through segregation of NMU's and vehicular traffic.
- Increased movement in and around the area through increased facilities for crossing main carriageways.

Evaluation

6.7. A segregated route for NMUs has been provided along the whole length of the scheme on the north side between Parkgate and Woodbank junctions (Figure 6-1) and west of the road from Woodbank to Deeside Park junction. Much of it runs immediately alongside the dual carriageway, but east of Woodbank Junction it diverts along Woodbank Lane and Lodge Lane, and east of Parkgate Rd Junction, it follows Powey Lane and part of the old A5117.

This route is part of National Route 563 of the National Cycle Network, which connects to the Connah's Quay/Chester Railway Path.

Figure 6-1 NMU route alongside northern carriageway of A494 at FYA

6.8. There is also an NMU route part of the way on the south side of the scheme, between Deeside Park Junction and Lodge Lane, at this point the NMU route crosses the A494 on the new Lodge Lane Bridge and joins the NMU route to the north of the scheme. Before the scheme opened, NMUs had to cross free-flowing traffic here and therefore the installation of a bridge at Lodge Lane has provided cyclists, equestrians and pedestrians with safer crossing points. The bridge was also provided for use by vehicles gaining access to local properties and agricultural use.

6.9. In addition, pedestrian crossing points have been included as part of the NMU route. At Woodbank Junction, a 'Pegasus' crossing (Figure 6-2) allows NMUs to cross the A550 north of the junction and at the Parkgate Rd Junction, the new signal controlled junction allows NMUs to cross the A540, north of the junction. Although both of these crossings are at-grade, it should be noted that neither cross the trunk road.

Figure 6-2 Pegasus Crossing of A550 at Woodbank Junction at FYA

6.10. In summary, the impact on severance is **slight beneficial**, as expected, due to the provision of improved facilities and this remains the case at FYA.

Integration

Transport Interchange

Forecast

6.11. This sub-objective concerns the impact on changing between transport modes. The AST stated that the impact of the scheme on transport interchange would be neutral as:

'Local traffic and bus services in the area could be affected during the construction phase, but operations would be improved post construction. Negligible interchange takes place'.

FYA Evaluation

6.12. At OYA, it was considered that a reduction in congestion will have brought improvements including:

- Lighter traffic volumes have results in a more pleasant waiting environment for local bus users (largely through removal of traffic, reduced noise, and improved roadside air quality); and
- Reduced traffic volumes have helped to reduce the severance that previously affected parts of the A5117 and A550. Consequently the accessibility and safety of bus stops on both sides of the route appear to have been improved.

6.13. The OYA evaluation stated that any impacts on transport interchange are not due to the improvement are facilities but through the removal of through traffic. At OYA, the impact was as expected and as there is no reason to expect any changes since then, the FYA assessment is **neutra**l as expected.

Land Use Policy and other Government policies

6.14. The AST scored the impact of the scheme on land use policy as beneficial reasoning that the scheme:

'Supports policies in PPG1, PPG4, PPG13, RPG13, development plans and Local Transport Plans, contrary to PPG2, PPG9 and PPG16'.

6.15. The AST also scored other Government policies as beneficial as AST forecast the scheme would:

'Support economic and social policies'.

6.16. The OYA report evaluated in detail how the observed impacts of the scheme corresponded with the forecast impacts on national, regional and local policies. The forecast were set out in detail in Policies – see ES vol 2 table 13.1.

6.17. Table 6-1 shows the FYA impact of the scheme on key national, regional and local policies. The results show that the impact of the scheme on land use policy and other Government policies is '**beneficial'**, as expected, which is the same as at OYA.

Table 6-1 Assessment of Land Use Policy and other Government policies

	Policy/Document	Relevant Policy Objective/Reference	Relevant Scheme Impacts	Alignment
Local and Sub-Regional Policies	**Cheshire West and Chester County Council** ***Cheshire Local Transport Plan (2006 – 2011)***	• Contains a number of major schemes on the wider strategic network that will improve the trunk road network, including this scheme which would be: - A key link between West Cheshire, the North West and North Wales; - Critical to improvement access to jobs and movements between Merseyside and North Wales (including Airbus and the Deeside Industrial Park; and - Major reduction in casualties. - The scheme is identified as a 'Regional Driver' maximising benefits from investment in the strategic network.	• The scheme contributes towards the following Local Transport Plan objectives: - Improve safety for all travellers; - Contribute to an efficient economy and to support sustainable economic growth and regeneration in appropriate locations; and - Manage a well maintained and efficient transport network.	✓
	Cheshire 2016: Structure Plan Alteration (adopted 2005)	• The Structure Plan establishes the strategic planning framework for development and transport infrastructure in Cheshire. The following policies within the Structure Plan support the scheme: - Policy T9: Government guidance requires Structure Plans to include improvements to the trunk road network, which are proposed by the Department for Transport. The following motorway and trunk road schemes are proposed to be implemented by the Department for Transport – A5117 Deeside Parks Junctions improvements - Policy T3: Measures to manage the demand for travel and reduce the environmental impact of traffic will be implemented to address Cheshire's transport problems.	• The scheme opened in March 2009, which is in line with the Structure Plan proposals. • Although the scheme is not located in any of the Areas of Special County Value for Landscape outlined in Policy R2 or GEN 2, it does run through Green Belt land and accordingly which is not in line with the general Structure Plan principle of: - Protecting the Green Belt and minimising development on open land outside the Green Belt - Within the Green belt, planning permission will not be given for inappropriate development, except in very special circumstances. • As the scheme was also proposed in the document, the scheme is not considered to be contrary to any green belt policy.	✓
	Flintshire County Council Unitary Development Plan Deposit Draft (2000 – 2015)	• Within the UDP, the A550/A541 is considered part of the primary highway network and A5117 Deeside Park Junction improvement scheme is safeguarded through policy AC17 and specifically mentioned as follows: - 'The A494/A550 is a key part of the primary road network providing links to the motorway network in North West England. These routes carry a heavy volume of traffic and have a poor safety record'.	• The scheme opened in March 2009 and forms part of the primary road network in the region. • It should be noted that the scheme is within a Green Barrier from Sealand to the Cheshire Border (north of the River Dee) within which development is restricted as outlined in Policy GEN 5.	✓
	Chester City Council: **Chester District Local Plan (2006 – 2009)**	• Policy TR 18 identifies that land required for the construction of the A550/A5117 Deeside Park improvement scheme will be safeguarded from development. In addition, Policy TR 20 states - 'All developments involving the construction of new public highways shall be designed to incorporate measures to assist access by/for pedestrians, cyclists and public transport'.	• The scheme has successfully opened. • The scheme has delivered an NMU route along the length of the scheme and a bridge at Lodge Lane has been installed which provides a safe crossing point. In addition, pedestrian crossing points have also been installed. Overall, the scheme has improved accessibility and reduced severance.	✓
	Ellesmere Port and Neston Borough Council (adopted 2002)	• The scheme conforms to Local Plan policy TRANS2 Highway network which states: - 'The Borough Council will seek the improvement of the existing highway network by means of highway schemes to improve the economic links to the Borough, with new or improved access to employment areas, traffic management and calming and other improvement schemes but with particular emphasis placed on road safety, the needs of public transport, disabled people and pedestrians'.		✓
Regional Policy	**North West Regional Economic Strategy**	• The Regional Economic Strategy identifies the need to 'reduce congestion and increase the use of public transport, including the use of mass transit for the Mersey Belt with links to Deeside'.	• The scheme has helped to address this issue through the reduction of congestion, providing less delays to public transport accessing Deeside.	✓

	Policy/Document	Relevant Policy Objective/Reference	Relevant Scheme Impacts	Alignment
National Policy	**North West Regional Spatial Strategy to 2021 (2008)**	• The overarching vision of the Strategy is to deliver sustainable development, which will lead to a higher quality of life and reduce 'social, economic and environmental disparities'. • Contributing to reducing carbon dioxide and greenhouse gas emissions is also part of the overall vision. • The Strategy contains a number of specific policies ranging from managing travel demand (DP 5) to Minerals Extraction (EM 7).	• The scheme is located along a route identified as being of strategic national importance, the M56/A5117(T)/A550(T) West from M60 at Junction 4 to Wales. The scheme is in line with the policies outlined below: - Policy DP 4: Make the Best Use of Existing Resources and Infrastructure - Policy W 1: Strengthening the Regional Economy - Policy RT 4: Management of the Highway Network - Policy RT 9: Walking and Cycling • Due to the loss of green belt land, the scheme does not meet the following policy: - Policy RDF 4: Green Belts	✓
	PPG2 **PPG 9**	• Planning Policy Guidance (PPG) has been replaced by the National Planning Policy Framework (NPPF) in 2012. PPGs identified the Government's national policy and town planning principles. Details of PPG2 and PPG9 are provided below: **PPG 2: Green Belts** - Inappropriate development within Green Belt land should not be accepted; - Green Belts must be protected for the future; and - Developments including engineering and other operations are inappropriate for Green Belt land unless they maintain openness and do not conflict with the purposes of including land in the Green Belt. **PPG 9: Biodiversity and Geological Conservation** - Development proposals should include beneficial biodiversity or geological features; - The reuse of previously development land for new development contributes to sustainable development by reducing the amount of undeveloped land that needs to be used.	• It is noted that the scheme is located in an area of green belt to the northwest of Chester and therefore involves the loss of green belt land. The adverse impact of the scheme on green belt policy means that the scheme is contrary to PPG2 'Green Belts' and PPG9 'Biodiversity and Geological Conservation'. • The scheme is in line with nature conservation, noise and other environmental issues.	✓

Key Points – Accessibility and Integration

Accessibility

- A non-motorised user (NMU) route has been provided along the length of the scheme and a bridge at Lodge Lane has been installed which provides a safe crossing point of the trunk road for cyclists, equestrians and pedestrians. Pedestrian crossing points of other roads have also been included as part of the NMU route. Overall, these measures have reduced severance and improved accessibility.
- Safe access over the trunk road is provided for local properties including agricultural requirements.
- The scheme has not led to any change in public transport provision.

Integration

- The scheme has had no impact on transport interchange.
- The scheme supports national, regional and local land use policies, except for those supporting

7. Appraisal Summary Table

7.1. An Appraisal Summary Table (AST) is a one-page summary of the predicted economic, environmental, and social impacts of a major road scheme.

7.2. The Evaluation Summary Table (EST) has been devised for the POPE process to record a summary of the actual scheme impacts. Where possible the EST mirrors the appearance and process of the AST, to permit comparison between the two. The EST for this scheme is given in Table 7.2.

Table 7-1 Appraisal Summary Table

Option: A5117 Deeside Park Junctions Improvement Scheme		Description: Improved alignment of A5117 and grade separation at 4 junctions, with collector-distributor roads to replace some restricted turning movements	Problems: Traffic congestion and delay, at 4 junctions on A5117/A550, for through and cross movements, owing to low mainline capacity and large number of vehicle	Present Value of Costs to Public Accounts £60.772m
OBJECTIVE	**SUB-OBJECTIVE**	**QUALITATIVE IMPACTS**	**QUANTITATIVE ASSESSMENT (Low/Central Case/High)**	**ASSESSMENT**
ENVIRONMENT	**Noise**	A comparison between the Do Something and Do Minimum for 2022 shows a balance between adverse effects and benefits. Most changes are marginal.	Population annoyed Do Minimum 22.9 Population annoyed Do Something 23.2	0.3
	Local Air Quality	In overall terms the level of air pollutants at properties reduce with the scheme. Adverse effects for some properties are outweighed by improvements at others. Air Quality objective met. Assessment assumes 3 properties demolished.	Number of properties with an improvement: PM_{10} -307, NO_2 -195 Number of properties with a deterioration: PM_{10} +1982, NO_2 +2094	PM_{10} -283.8 NO_2 -265.3
	Regional Air Pollution	Reduction in NO_X emissions with the junction improvements in 2007 compared with the Do Minimum in 2007 is -13. No change in PM_{10}.		
	Greenhouse Gases	CO_2 emissions increase by 5% with the junction improvements due to the predicted increase in vehicle flows along A5117 and A540, increase in average vehicle speed and an increase of 15% in vehicle kilometres travelled on the local road network in 2007.		+2503 tonnes
	Landscape	Landscape feature and elements present are typical of the locality. Adverse impacts are due to increased scale of 3 junctions, loss of vegetation and new bridge at Lodge Lane; but effects are limited by proposed planting and mounding and because the existing road is already a major feature in the landscape.		Slight adverse
	Townscape	N/A		
	Heritage of Historic Resources	Archaeology – no evidence of remains of national importance. Locally important sites include Shotwick medieval Deer Park, 2 historic routes and palaeo-environmental interest. Neutral effect given mitigation including preservation by record. No direct effects on Built Heritage. Setting of Shotwick Conservation Area would benefit. Balance of effects for Historic Landscape Character. Some slight adverse effects on field boundaries, but overall character not compromised.		Neutral
	Biodiversity	Biodiversity features are typical of the locality. The proposals are an online improvement in highly agricultural area. Existing species diversity is low. No significant effects on sites designated for nature conservation. River Dee and Mersey Natura 2000 sites not affected. Some loss of terrestrial habitats for Great Crested Newts and loss of woodland / hedges. Opportunity to enrich the local ecology with habitat creation.		Slight adverse
	Water Environment	Water features and elements are typical of the locality. There will be an improvement in the chemical water quality and a reduction in the peak flow within the watercourse regime, due to sedimentation and attenuation ponds.		Slight beneficial
	Physical Fitness	It is not possible to forecast accurately the numbers involved but new facilities along the A5117 for pedestrians and cyclists improved crossing points increase opportunities for physical exercise.		Beneficial
	Journey Ambience	The balance of sub factors suggests the proposals would make the overall journey ambience better with increased interest in views from the road, less congestion, reducing frustration and a reduced fear of accidents. With flows in excess of 10,000 travellers per day the impact is large.		Large beneficial
SAFETY	**Accidents**	Across wider area, scheme will have neutral accident impact: large reduction in junction accidents, with a small casualty saving, will be balanced by a small increase in link accidents with high casualty cost. Taking the scheme corridor by itself, the improvements will have a positive net accident benefit in all scenarios. Small net accident cost during maintenance and scheme construction	Wide area saving in No. accidents: 676/549/521; Wide area saving in casualties: Fatal -8/-13/-15; Severe 7/-19/-25; Slight 88/711/677; Wide area accidents PVB: £8.733m/£0.722m/-£1.280m; [Scheme corridor saving in No. accidents: 584/442/352]; [Scheme corridor accident PVB: £9.897m/£3.486m/£0.751m]; Increase in No. accidents during maintenance & construction: 4.67/4.84/5.02; PVB: -£0.412m/-£0.427m/-£0.440m;	PVB Low £8.321m PVB Central £0.295m PVB High -£1.720m
	Security			
ECONOMY	**Public Accounts**	Scheme will require significant public capital expenditure; split of capital cost (2002 undiscounted) will be: 76% construction; 11% land; 9% preparation; 4% supervision	Central Govt capital PVC: (discounted) £41.517m; Central Govt lost tax revenue during operation PVC: £14.111m/£20.357m/£46.442m; Central Govt lost tax revenue from maintenance/construction PVC: £0.283m/£0.313m/£0.367m; Central Govt net maintenance PVC: (discounted) -£1.415m;	PVC Low £54.496m PVC Central £60.772m PVC High £86.911m
	Transport Economic Efficiency: Business Users & Transport Providers	Business users will gain Journey time and vehicle operating cost benefits, through removal of junction delays along and across the A5117 and through discouragement to some traffic from using the longer A55 route. Freight and public transport operators will also benefit.	Business Users PVB: £302.287m/£571.099m/£759.109m; (Transport Providers Included within Users Other PVB £0m); Business User delays from maintenance/construction PVB: -£7.026m /-£6.559m/-£6.353m; (of which, -£0.016m/-£0.015m/-£0.014m to Transport Providers);	PVB Low £295.261m PVB Central £564.540m PVB High £752.756m
	Transport Economic Efficiency: Consumers	Consumer users will also gain Journey time and vehicle operating cost benefits, through removal of junction delays along and across the A5117 and through discouragement to some traffic from using the longer A55 route.	Consumer Users PVB: £247.155m/£461.507m/£617.293m; Consumer User delays from maintenance/construction PVB: -£6.447m/-£6.303m/-£6.343m	PVB Low £240.708m PVB Central £455.204m PVB High £610.950m
	Reliability	Improved A5117 capacity, alignment and ease of junction access will provide better speed / flow characteristics and more consistent journey times	No quantitative assessment of reliability benefits has been made	Moderate beneficial
	Wider Economic Impacts	Increase in jobs accessible in Regeneration Area (RA), based on changes in accessibility	0 – 25,719 increase in jobs accessible to work force in RA 141 – 703 increase in employment of residents in deprived wards	141 – 703 increase in employment of residents in deprived wards
ACCESSIBILITY	**Option values**	N/A		
	Severance	Improved crossing points including a bridge at Lodge Lane would reduce severance for pedestrians, cyclists and equestrians. Public footpaths diverted to cross the highway would be longer but safer to use.		Slight positive
	Access to Transport System	Pedestrian access to bus stops on A550 improved.		Slight positive

INTEGRATION	**Transport Interchange**	Local traffic and bus services in the area could be affected during the construction phase, but operations would be improved post construction. Negligible interchange takes place.			Neutral
	Land-Use Policy	Supports policies in PPG1, PPG4, PPG13, RPG13, development Plans and Local Transport Plans. Contrary to PPG2, PPG9 and PPG16.			Beneficial
	Other Government Policies	Supports economic and social policies.			Beneficial
ECONOMIC APPRAISAL SUMMARY			60-Year Evaluation Results		Central Case BCR: 16.78
			PVB (high)	£1,361.986m	
			PVB (low)	£544.290m	
			PVB (Central Case)	£1,020.039m	
			PVC (high)	£86.911m	
			PVC (low)	£54.496m	
			PVC (Central case)	£60.772m	
			NPV (High)	£1,275.075m	
			NPV (Low)	£489.794m	
			NPV (Central Case)	£959.267m	

Table.7-2 Evaluation Summary Table

OBJECTIVE	SUB-OBJECTIVE	QUALITATIVE IMPACTS	QUANTITATIVE ASSESSMENT	ASSESSMENT
ENVIRONMENT	**Noise**	Although FYA observed traffic flows are lower than predicted, they are within 20% of forecast and based on POPE methodology noise remains as expected at FYA.		As expected
	Local Air Quality	Observed traffic flows are lower than those predicted (more than 1000 AADT) in two locations and slightly higher in one location. Overall it is presumed that the impact of the scheme is better than expected for air quality.		Better than expected
	Regional Air Pollution			
	Greenhouse Gases	Net increase due to higher flows and speeds.	549 tonnes	
	Landscape	Landscape planting is generally establishing well and is expected to achieve it screening, mitigation and integration targets. The contract aftercare period reduction to three years, whilst not affecting overall growth trends, has resulted in areas of uncontrolled noxious weed infestation. The Gateway features installed as a part of the scheme appear to have not received the required maintenance and do not have the required visibility to allow for their appreciation.		Slight adverse As expected
	Townscape	Not applicable to this scheme in a rural area		n/a
	Heritage of Historic Resources	No further evaluation required at FYA.		Neutral As expected
	Biodiversity	Without the monitoring information it is not possible to evaluate the effect of the scheme for biodiversity in any detail. This is despite the conclusion that woodland and hedgerow progress / habitat establishment within the site appears to be progressing well. A concern over the prevalence of noxious weeds within the species-rich grassland remains a concern and may impact negatively on the overall successful establishment of this important habitat		*Assumed Slight Adverse* No final assessment
	Water Environment	Drainage mitigation has generally been provided as proposed and POPE is not aware that it is performing other than as expected. No water quality or discharge flow information has been available to POPE to confirm whether any improvements have occurred.		Slight Beneficial As expected
	Physical Fitness	PRoWs show signs of use, including cyclists throughout and pedestrians mainly at the Deeside Park junction. All PRoW appeared well maintained for ease of use. Improvements at the various crossing points over the A494 were in place as expected.		Beneficial As expected
	Journey Ambience	Congestion on the A494 (previously the A5117) has reduced, driver views are as expected and the improvement in pedestrian crossing provision is anticipated to have reduced fear of collisions as expected.		Large beneficial As expected
SAFETY	**Accidents**	Reduction in collision numbers and lower rate is statistically significant and better than expected	Annual saving of 14, £18.3m	Better than expected
	Security	Reduction in risk of smash & grab type crime at the junction which is now free-flow		Slight Beneficial As expected
ECONOMY	**Public Accounts**	Investment cost 18% above predicted cost	PVC=£77.2m including indirect tax as a cost	Worse than expected
	Business & Consumer Users	Journey time savings for users on the scheme of £173.6m	£173.6m	Below large benefits predicted for wide area
	Reliability	Increased capacity and free-flow movement for trunk road traffic will have improved reliability	No quantitative assessment	Moderate beneficial as predicted
	Wider Economic Impacts	Regeneration areas near the scheme in Wales should benefit from the improved connectivity through the reduced journey times and improved reliability.	No quantitative assessment	Beneficial As expected
.ACCESSIBILITY	**Option Values**	Not applicable		n/a
	Severance	Provisions for NMUs have been provided		Slightly beneficial As expected
	Access to the Transport System	NMU route improvements have improved access to bus stops		Slightly beneficial As expected
INTEGRATION	**Transport Interchange**	Negligible interchange		Neutral As expected
	Land Use Policy	Scheme is regarded to be of strategic national importance and is in line wide range of regional and local policies, except for those regarding the green belt.		Beneficial As Expected
	Other Government Policies	Scheme supports polices to improve access to jobs and to improve road safety.		Beneficial As Expected

8. Conclusions

Introduction

8.1. To conclude this report, this section summarises how the scheme is meeting its scheme objectives, and assesses the scheme's impacts against those forecast.

Success against Objectives

8.2. The objectives can be categorised as follows:

- DfT's objectives: Impacts are assessed against the Government's five objectives for Transport; environmental impact, safety, economy, accessibility and integration; and
- Scheme specific objectives.

DfT objectives

8.3. The scheme's successes against the standard five objectives and sub-objectives are presented in full in the form of the Evaluation Summary Table (EST) in Table.7-2.

Scheme-specific Objectives

8.4. Drawing upon information presented in this report, a summary of the scheme's successes against the scheme-specific objectives for each phase, as listed previously in Section 1 of this report is provided in Table 8.1.

Table 8.1 Fulfilment of Scheme Objectives

Objective	Has the scheme objective been achieved?	
To improve safety for all users	Collision data shows improvement which is significant	✓
To benefit the economy by reducing congestion and improving journey time reliability	Journey times show savings and delays reduced	✓
To minimise adverse impacts to people, property, landscape, and sensitive ecological areas	Mitigation measures in place	✓
To improve access to local communities and business	Improved journey times for road users and provisions in place for non-motorised users and farm access	✓
To provide a safe route for cyclists, pedestrians, and horse-riders	Provisions are in place	✓

Appendix A. Environment Sources

Table A-1 Information requested to evaluate the environmental sub-objective.

Environment Specific Requirements	OYA Response	FYA Response
Environmental Statement	Volume 1, 2 and 3 received	As at OYA
Appraisal Summary Table	Received	As at OYA
Any amendments, updates or addendums to the ES or any relevant further studies or reports. Any significant changes to the scheme since the ES.	None	As at OYA
'As Built' drawings for landscape, ecological mitigation measures, drainage, fencing, earthworks etc.	Landscape and Ecology As Built drawings provided Drainage As Built drawings not provided	All as-builts received at FYA
Health and Safety File	Received	As at OYA
Construction Environment Management Plan	CEMP provided	As at OYA
Relevant contact names, of people with knowledge of the scheme:	Provided by Highways England	Researched and followed on from OYA contacts
Archaeological reports (popular and academic)	Archaeology Watching Brief	Same as OYA
List of Part 1 Claims regarding noise, air quality or lighting (from Highways England National Part 1 Team)	Too early in the claims process and will be provided for 5YA report	No longer a POPE data request
Results of any post opening survey or monitoring work e.g. ecology surveys, water quality surveys pre- and post-construction	Ecological survey and monitoring reports	No updated monitoring reports received at FYA
Animal mortality data, pre and post scheme construction	Provided by MAC	Update from 2012 received from MAC but contained no mortality figures for the A494
Any scheme newsletters or publicity material for the scheme	Available on Highways England web page – the story of construction	As at OYA
Non-motorised User (NMU) audit report	Non-Motorised Users Audit Report (March 2009);	As at OYA
HEMP	Draft HEMP received	No final HEMP was received at FYA
Ecology License	Natural England Badger Licences 2006 and 2007 and Great Crested Newt Licence Number EPSM2008-360 G	As at OYA

Appendix B. Environment Comparison Photographs and Evaluation Tables

Comparison of Photographs A5117 Deeside Park Junctions Improvements

Viewpoint 1

Figure 1a: Taken from ES (2005) showing the baseline view from a location to the north of Deeside Park Junction looking over the existing A550 in a north easterly direction.

Figure 1b: Predicted opening year view taken from ES (2005) looking towards the proposed junction improvements between Woodbank Junction and Deeside Park Junction. New lighting and signage visible.

Figure 1c: Comparison viewpoint taken at OYA (October 2010) illustrating that the junction improvements between Woodbank Junction and Deeside Park Junction, including lighting and signage, have been implemented as expected. This OYA view was taken from a location slightly to the north of that included within the ES; as a result the footpath and signage appear more prominent in the view. The photograph indicates that the degree vegetation removal near to the link bridge has been slightly greater than expected however it is not considered that it will significantly alter the impacts on visual receptors in the longer term when the scheme planting establishes.

Figure 1d: Comparison view taken at FYA (July 2014) shows significant growth of woodland planting and its screening effects.

Viewpoint 2

Figure 2a: Taken from the ES (2005) showing the baseline view from a public footpath located to the north west of Woodbank Junction. Looking towards the A550 and Woodbank Junction.

Figure 2b: Predicted opening year view taken from the ES (2005) illustrating the screening effects of the proposed mound to be located on the western boundary of Woodbank Farm.

Figure 2c: Comparison viewpoint taken at OYA (October 2010) illustrating that the mounding is providing screening as expected.

Figure 2d: Comparison view taken at FYA (July 2014) illustrating good vegetation growth providing additional screening as expected

Viewpoint 3

Figure 3a: Taken from the ES (2005) showing the baseline view from a public right of way located to the south west of the existing A550.

Figure 3b: Predicted opening year view taken from the ES (2005) illustrating the view of the proposed junction improvements between Deeside Park Junction and Woodbank Junction.

Figure 3c: Comparison viewpoint taken at OYA (October 2010) illustrating the junction improvements between Deeside Park Junction and Woodbank Junction. The additional mound located between carriageways is clearly visible to the right of the view. The footpath seen on this OYA view was anticipated at the time of the ES.

Figure 3d: Comparison viewpoint taken FYA (July 2014) show good plant growth on the additional mound (see photograph insert)

Viewpoint 4

Figure 4a: Taken from the ES (2005) showing the baseline view from a proposed footpath location point to the south of the A5117, to the west of Pleasant View Farm.

Figure 4b: Predicted opening year view taken from the ES (2005) illustrating the view of the proposed footpath route and Lodge Lane Overbridge.

Figure 4c: Comparison viewpoint taken at OYA (October 2010) illustrating that the footpath route, Lodge Lane Overbridge and the gentle regrading of land has been undertaken as expected.

Figure 4d: Comparison viewpoint taken at FYA (July 2014) illustrating satisfactory plant growth for the hedgerow. It is noted that the footpath is an access track for vehicles in addition to being a PRoW. The ES proposed wide paved access has not been implemented

Viewpoint 5

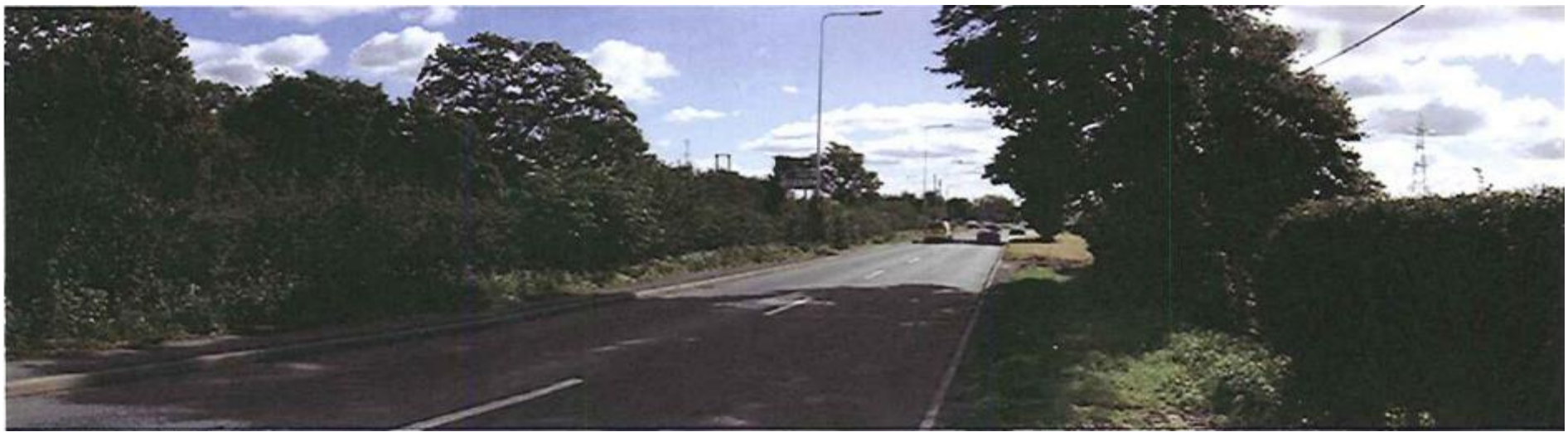


Figure 5a: Taken from the ES (2005) showing the baseline view from the A540, north of the A540 Junction.

Figure 5b: Predicted opening year view taken from the ES (2005) illustrating the view of the proposed A540 junction, traffic signalled junction and proposed landscape mound are visible

Figure 5c: Comparison viewpoint taken at OYA (October 2010) illustrating the junction improvements at the A540. At the request of the landowner the landscape mound has not been constructed. However, hedgerow planting has been undertaken to the boundary of the field adjacent to the A540, it is anticipated that this will provide some assimilation of the junction when viewed from Mill Cottages.

Figures 5d: Comparison viewpoint taken at FYA (July 2014) illustrating the good growth of the hedgerow as discussed at OYA. It is noted that there is additional road signage to that proposed in the ES.

Viewpoint 6

Figure 6a: Taken from the ES (2005) showing the baseline view of the existing A5117 from a footpath route located to the south of the road the A540 junction.

Figure 6b: Predicted opening year view taken from the ES (2005) illustrating the proposed view of the drainage ponds in the foreground.

Figure 6c: Comparison viewpoint taken at OYA (October 2010) illustrating the amended scheme without the drainage ponds. The ponds have not been implemented in line with recommendations of the Planning Inspector.

Figure 6d: Comparison viewpoint taken at FYA (July 2014) illustrating the visibility of the scheme remains at FYA. Although a hedgerow has been planted along the highway boundary, it is not expected to provide significant screening on the A494 as predicted in the ES.

Appendix C. Tables and Figures in this Report

Tables

Figures

Appendix D. Glossary

Term	Meaning
AADT, ADT	**Annual Average Daily Traffic.** Average of 24 hour flows, seven days a week, for all days within the year. ADT non annualised average daily traffic
Accessibility	**Accessibility** can be defined as 'ease of reaching'. The accessibility objective is concerned with increasing the ability with which people in different locations, and with differing availability of transport, can reach different types of facility.
AST	**Appraisal Summary Table**. This records the impacts of the scheme according to the Government's five key objects for transport, as defined in DfT guidance contained on its Transport Analysis Guidance web pages, WebTAG
ATC	**Automatic Traffic counter**
AWT	**Average Weekday Traffic.** Average of Monday to Friday 24 hour flows.
BCR	**Benefit Cost Ratio** This is the ratio of benefits to costs when both are expressed in terms of present value i.e. PVB divided by PVC
bvkm	billion vehicle kilometres
CO_2	**Carbon Dioxide,** for transport, this is the main greenhouse gas
COBA	**Cost Benefit Analysis** – a computer program which compares the costs of providing road schemes with the benefits derived by road users (in terms of time, vehicle operating costs and collisions), and expresses the results in terms of a monetary valuation. The COBA model uses the fixed trip matrix unless it is being used in collision-only mode.
DfT	**Department for Transport**
dHEMP	Draft HEMP
Discount Rate	The percentage rate applied to cash flows to enable comparisons to be made between payments made at different times. The rate quantifies the extent to which a sum of money is worth more to the Government today than the same amount in a year's time.
Discounting	Discounting is a technique used to compare costs and benefits that occur in different time periods and is the process of adjusting future cash flows to their present values to reflect the time value of money, e.g. £1 worth of benefits now is worth more than £1 in the future. A standard base year needs to be used which is 2002 for the appraisal used in this report.
Do Nothing	In scheme modelling, this is the scenario which comprises only the existing road network.
Do Something	In scheme modelling, this is the scenario detailing the planned scheme plus improvement schemes that have already been committed
EA	**Environment Agency**

Term	Meaning
EN	**English Nature**
EST	**Evaluation Summary Table**. In POPE studies, this is a summary of the evaluations of the TAG objectives using a similar format to the forecasts in the AST.
FWI	**Fatalities & Weighted Injuries**
FWI/bvkm	This figure is a combined measure of casualties based on the numbers of fatal, serious and slight casualties. It is weighted by severity of injuries, with fatalities having the highest weighting. It can be expressed as a ratio per collision, per year or based on the amount of travel (bvkm, billion vehicle kilometres).
FYA	**Five Years After**
GCN	**Great Crested Newt**
HEMP	**Handover Environmental Management Plan**
HGV	**Heavy Goods Vehicle**. In the context of this report, the precise definition of the term is dependent on the way that traffic is being measured. Currently, traffic flow data as measured by ATCs uses a length based classification – the term HGV is used to refer to vehicles greater than 5.2m. Shorter vehicles are classified as 'light'.
LMVR	Local Model Validation Report
MAC	**Managing Agent Contractor –** organisation normally contracted in 5-year terms for undertaking the management of the road network within a Highways England area.
NE	**Natural England**
NMU	**Non-Motorised User**. A generic term covering pedestrians, cyclists and equestrians
NO_2	**Nitrogen Dioxide**
NRTF	**National Road Traffic Forecast.** This document defines the latest forecasts produced by the Department of the Environment, Transport and the Regions of the growth in the volume of motor traffic. At the time this scheme was appraised, the most recent one was NRTF97, i.e. dating from 1997.
OYA	**One Year After**
PIC	**Personal Injury Collision**. A road traffic collision in which at least one person required medical treatment.
PIC/mvkm	Ratio of **PIC** to the level of travel measured in million vehicle kilometres **(mvkm)**
PRoW	**Public Right of Way**
Present Value	**Present Value** is the value today of an amount of money in the future. In cost-benefit analysis, values in differing years are converted to a standard base year by the process of discounting giving a present value.

Term	Meaning
PVB	**Present Value Benefits** Value of a stream of Benefits accruing over the appraisal period of a scheme expressed in the value of a Present Value
PVC	**Present Value Cost** As for PVB but for a stream of costs associated with a project
SATURN	**Simulation and Assignment of Traffic in Urban Road Networks**
STATS19	Record of injury collision statistics recorded by police officers attending collisions
TEMPRO	**Trip End Model Presentation Program** Program which provides detailed trip forecast including split by geographical area
TERN	**Trans-European Network**
TEN-T	**Trans-European Transport Network**
WEBTAG	Department for Transport's website for guidance on the conduct of transport studies at http://www.webtag.org.uk/