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SO23 8UD

# **Fareham Strategic Development Area A32 Realignment Options Identification**

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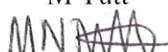
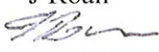

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# Fareham Strategic Development Area

## A32 Realignment

### Options Identification

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## Glossary of Abbreviated Terms

<b>Abbreviation</b>	<b>Definition</b>
D2AP	Dual Carriageway with 2 lanes in each direction with no hard shoulder
D2M	Dual Carriage Motorway with 2 lanes in each direction with hard shoulder
D3M	Dual Carriage Motorway with 3 lanes in each direction with hard shoulder
DMRB	Design Manual For Roads and Bridges
ITS	Integrated Transport Study
S2	Single carriageway – one lane in each direction
SDA	Strategic Development Area
TERN	Trans-European Road Network

# 1 INTRODUCTION

## 1.1 Background

The South East of England Regional Assembly submitted the draft South East Plan to central Government on 31 March 2006. This document provides the framework for development of the region to 2026. It reviews towns, cities and the countryside across the region and shows how demand for new housing and economic growth will be met with investment in new transport and infrastructure. It also covers how the region will conserve and enhance the natural environment.

In response to the draft plan the Secretary of State for Communities and Local Government has responded on 17<sup>th</sup> July 2008 recommending changes. The Regional Assembly is reviewing the comments for incorporation into the final South East Plan.

The plan sets out how sustainable development will be achieved while protecting the environment and combating climate change. The plan breaks the region into several sub-regions, one of which is South Hampshire which covers the districts of Eastleigh, Fareham, Gosport, Havant, Portsmouth and Southampton, and parts of East Hampshire, New Forest, Test Valley and Winchester districts.

The aim for the sub-region is to improve economic performance up to 2026, which will allow for the provision of approximately 80,000 net dwellings within this time period. Within this sub-region, there are two Strategic Development Areas (SDAs) identified that will support a substantial number of housing and economic opportunities. The area north of Fareham has been identified as one of those two areas.

To allow the successful delivery of the SDA, provision must be made for co-ordinated and integrated employment, transport and housing development, together with supporting health, community, social, shopping, education, recreation and leisure facilities, and green space. In particular, quality transport links need to be provided to ensure this occurs.

## 1.2 Objectives

The overall aim of the highway intervention is to:

- Improve the accessibility to local services and facilities;
- Address the ‘infrastructure deficit’ in the transport network;
- Support the improved economic performance of South Hampshire; and
- Preserve and enhance quality of life for South Hampshire residents.

### **1.3 Planning Brief**

Mott Gifford has been commissioned to investigate the potential provision of a new link road between the A32 Wickham Road and M27 Junction 11 as part of the access arrangements for the Strategic Development Area. Several general alignment options have been considered and these have been drafted figuratively through indicative centreline horizontal alignments with junction locations on the Wickham Road, together with an indication of potential land-take. The study summarises the initial findings including a comparative analysis table against common criteria such as cost, geometry and environmental impact.

The study has been primarily based on desktop research with limited site investigation. The scope of the work was to;

- Carry out observational survey of existing physical constraints such as topography and existing infrastructure;
- Review the SDA Area of Search Constraints Map prepared by Fareham Borough Council;
- Undertake desk search of information on underlying soils using the British Geological website;
- Consider alignment options;
- Assess potential land-take of new junctions on Wickham Road, and
- Prepare ‘order of magnitude’ costs for options based on typical ‘all in’ values derived from other schemes.

The options were assessed on the basis that the new link will have a 40 mph speed limit and will be a dual 2-lane all purpose road (D2AP).

## 2 EXISTING CONDITIONS

### 2.1 Description of Locality

The Fareham Strategic Development Area (SDA) is located to the north of M27, between junctions 9 and 11. The area has been extensively studied by the South East of England Regional Assembly with a view to incorporating a mixed-use development containing around 10,000 dwellings together with significant employment provision.

The proposed link road will connect the A32, from a point between the roundabout at Albany Farm and Junction 10, with the northern spur of junction 11 on the M27. Figure 2.1 shows the study area.



**Figure 2.1: Mapping and Satellite Photography showing the Fareham SDA**

## **2.2 Existing Transport Network**

Currently, M27 junction 10 has only east facing slip roads. This arrangement was originally based on design stage decisions aimed at preventing Wickham Road within Fareham being used for motorway access, and to encourage traffic to use junction 11.

The M27 Integrated Transport Study (ITS, 2000) highlighted the M27 as facilitating a number of functions. Strategically, it operates as part of the Trans-European Road Network (TERN) along the South Coast. Nationally, it also provides an important link for major north-south movements between Southampton and London via the M3 and between Portsmouth and London via the A3(M). Locally, it serves as a bypass to Southampton, Fareham and Northern Portsmouth.

The M27 is of typical dual 3-lane motorway standard (D3M) between Junctions 9 and 11, although climbing lanes have recently been implemented between Junctions 11 and 12 in both directions. The A32 is a single 2-lane carriageway (S2) that runs from Gosport to Alton.

The study area accommodates a network of roads used for access to the properties within the area. These roads are of low quality single carriageway standard and feature passing places to allow for traffic flow.

A number of Public Footpaths (14, 19, 101, 102, 103, 106, 108, 130, 107) and a Bridleway (100) traverse the study area. There are no cycle lanes located within the study area.

## **2.3 Topography, Land Use, Property and Industry**

The topography of the study area has been determined from Ordnance Survey mapping and a site walkover. The River Wallington runs along a valley perpendicular to the M27 between junctions 10 and 11 with natural 10% slope upwards to the east and west. The land level rises significantly along the A32 northbound peaking at Albany Farm. There is also a high point to the east of the SDA at Fort Nelson.

The land is currently populated by a number of farms, industrial buildings and an independent infant school. Agricultural machinery uses the existing network to access the farms. Much of the grassland in the area is fallow and currently used for grazing.

## **2.4 Geology**

The area of the proposed North Fareham SDA is predominantly located on the Cretaceous Chalk Formation deposits common within the area that can be seen in the cuttings of the M27. These deposits also form the Portsdown Hill Ridge. The Chalk Formation forms an aquifer of significant importance to the region. To the north of the Portsdown Hill ridge running east to west from Hayling Island towards the Whitely area there are Eocene deposits of the Oldhaven, Blackheath, Woolwich and Reading Formation, Thanet Formations and the London Clay Formation. These deposits are predominately made up of sand and clay deposits with occasional layers of round flint and sands common with the Oldhaven and Blackheath formations.

The Chalk which underlies the majority of the SDA would form an adequate foundation for embankment construction. Allowing for a proportion of the excavated material to be of poor quality, approximately 80% should be acceptable for embankment construction. The remainder should be suitable for use in landscaping areas.

The northern Eocene deposits are more likely to be susceptible to small changes in moisture content and therefore a lower proportion of 50% should be expected to be suitable for embankment construction, with the remainder suitable for use in landscaping areas.

## **2.5 Public Utilities**

The presence of utility plant was determined by the constraints plan provided by Fareham Borough Council (included in **Appendix A**).

## **2.6 Environment**

An environmental investigation has not been carried out for the purpose of this report, but in order to place the study area in context the following comments have been included. These are based on the constraints plan provided by Fareham Borough Council (included in **Appendix A**) and a brief review of information on publicly available websites.

### **2.6.1 Noise and Air Quality**

There are a number of farm properties and a school within the study area, for which the primary noise source is likely to be traffic on the M27. There are no noise barriers located between Junctions 10 and 11 of the M27. Fareham District Council has identified two Air Quality Management Areas in the vicinity, but both are to the south of the M27.

### **2.6.2 Landscape and Townscape**

The study area sits within the South Hampshire Lowlands (128) Character Area which is characterised by gently undulating landscape, predominately mixed farmland and woodland, a patchwork of small, intimate and irregular fields defined by hedges, winding lanes and scattered farmsteads. The five proposed options pass through or are located within close proximity to a number of county level Character Areas (Landscape and Urban). These include North Fareham Downs and Portsdown Landscape Character Areas and North Fareham, Furzehall/ Broadcut and Wallington Village Urban Character Areas.

An assessment of the landscape character and sensitivity of the study area has been undertaken by David Lock Associates (SDA Capacity Study) and the alignment options assessment in this report has considered their impact upon the landscape.

### **2.6.3 Heritage of Historic Resources**

There are a number of Listed Buildings within the study area, as indicated on the constraints plan in **Appendix B** as well as a number of archaeological sites. There are no Scheduled Ancient Monuments, Historic Rural Settlements or Conservation Areas within the study area. The closest site with statutory protection is the World War II Heavy Anti-Aircraft Gunsite at Monument Farm, which lies 990m north east of M27 junction 11 and is a Scheduled Ancient Monument. The alignment and junction options have sought to avoid impact upon listed buildings and further adjustments may need to be undertaken to take account of regional and locally important archaeological sites.

### **2.6.4 Biodiversity and Habitats**

A detailed habitat survey has not been undertaken as part of this study. Assessment of impact upon statutory or non statutory protected sites or species will need to be undertaken to ensure compliance with Habitat Regulations and to identify any future avoidance, mitigation or compensation measures. As a result the precise design and alignment of access infrastructure will need to be ascertained through further study.

### **2.6.5 Drainage**

The Wallington River runs north-south through the study area. The flood plain is identified as a 2008 Flood Zone 3 in the south of the area and a 2008 Flood Zone 2 in the north.

A groundwater source exists to the south of the M27 Junction 11 and so the entire SDA falls within a Water Protection Zone as indicated on the Constraints Drawing in **Appendix A**. The south eastern 1000m of the SDA is designated Water Source Protection Zone 1 and north-western 400m of the SDA including the Albany Farm is designated a Water Source Protection Zone 3. The remaining SDA is of Water Source Protection Zone 2.

## 3 DESCRIPTION OF ROUTE OPTIONS

### 3.1 General Layout and Standards

The route options have been designed assuming that the link road would be of D2AP standard with speed restriction of 40mph, which is consistent with a design speed of 70kph. The desirable minimum horizontal curvature for this speed is 720m, assuming normal 2.5% superelevation. The maximum longitudinal gradient has been set at 4% for the purposes of this study, in order to minimise user fuel costs. A standard cross-section has been assumed, consisting of 7.3m wide carriageways with 2.5m verges, separated by a 2.5m wide central reserve. Any relaxations or departures from standard that apply to the route options are identified in the following descriptions. In defining the approximate land-take, embankment and cutting slopes have been assumed at 1 in 2.

Outline layouts for each route alignment are shown on drawings in **Appendix B**, and a commentary on how each route performs against key criteria is shown in **Table 3.1**.

All of the routes cross at least one of the existing country roads and/or public rights of way. No consideration has been given as to how these crossings would be dealt with at this stage, as much will depend on the internal road network associated with the planned SDA.

### 3.2 Option 1

The route for Option 1 is illustrated on **Drawing 227552JG/HCC/6002**. It joins the A32 at the Albany Farm roundabout, which would need to be enlarged and remodelled to convert it to a 4-arm roundabout of sufficient size to provide adequate capacity. The approximate land take required for the roundabout is shown on **Drawing 227552JG/HCC/6003**, but it should be stressed that this could change when traffic forecasts are available to enable capacity testing to be carried out. It should be noted that the land take as shown would affect Albany Business Park, but it should be possible to avoid this by moving the alignment to the north on the approach to the junction.

The first 500m of the route slopes downwards from the roundabout to a maximum gradient of 4% in cutting up to 4.5m deep. This section has a large horizontal radius of 5000m and so would not require verge widening to achieve forward visibility standards.

The following 1150m would be on embankment up to 2.0m high, passing north of Whitedell Farm on a horizontal radius of 1100m, which again is large enough to avoid the need for verge widening. The vertical alignment over this section would be in the form of a shallow sag curve with a low point near the river crossing, rising to an uphill gradient of 3% on the east side. Within this section the route intersects the Wallington River flood plain, which at this point is 300m wide. It is likely that the Environment Agency would insist on a viaduct of at least this length in order to span the floodplain.

The route then continues for 750m on the same radius in a cutting up to 4.0m deep, with the vertical alignment increasing to a maximum uphill gradient of 4%. The horizontal radius then eases out to 5000m over the final 700m, of which the first third is on embankment and the remainder in cutting. The vertical alignment would also ease to about 1% to connect with the north spur at Junction 11.

The route alignment intersects two country roads and three public rights of way, all of which will need to be dealt with as part of the SDA masterplan. It also passes through a water source protection area, of which 400m is in zone 3, 2500m is in zone 2 and 200m is in zone 1.

This route passes primarily through an area underlain by Eocene deposits, of which only 50% may be suitable for embankment construction. Initial indications are that the route would result in 128,125m<sup>3</sup> of excavation, of which 80,575m<sup>3</sup> is expected to be suitable for embankment construction. The volume of fill required for embankment is estimated to be 63,150m<sup>3</sup>, indicating that sufficient material has been excavated to be used for the construction of embankments with 17425m<sup>2</sup> remaining for use in landscaping.

### 3.3 Option 2

The route for Option 2 is shown on **Drawing 227552JG/HCC/6004**. It joins the A32 at the same position as Option 1, requiring the same alterations to the existing roundabout, but it then diverges further to the south, heading more directly towards Junction 11. It would be more difficult to avoid taking land from Albany Business Park with this option, as a major readjustment affecting the whole route would be required.

The route runs in cutting up to 4.0m deep at either end and on embankment up to 4.0m high over the central section on the approaches to the viaduct over the Wallington River. For the first 500m the route runs downhill at gradient of 3% on a horizontal radius of 1100m, for which no verge widening would be required. The alignment then straightens out on a series of large radius bends with the vertical alignment also flattening off on the approach to the Wallington River, where the floodplain is 200m wide, requiring a viaduct of similar length. Once across the river, the route starts to rise up to a maximum gradient of 4% before flattening off to tie in with the north spur at Junction 11.

The route alignment intersects one country road and three public rights of way, all of which will need to be dealt with as part of the SDA masterplan. It also passes across a site of archaeological interest and through a water source protection area, of which 350m is in zone 3, 1400m is in zone 2 and 700m is in zone 1.

The route crosses an area underlain by Eocene deposits for the first 800m and then over the Chalk plain for the remainder of its length. The total volume of excavation is estimated to be 52550m<sup>3</sup>, of which 36950 m<sup>3</sup> is expected to be suitable for construction of embankments. The volume of fill required for embankment construction is estimated to be 71550m<sup>3</sup>, requiring 34600m<sup>3</sup> of additional material to be obtained either from landscaping of the surrounding area, or from import.

### 3.4 Option 3

The route for Option 3, shown on **Drawing 227552JG/HCC/6006**, joins the A32 at a new roundabout on the bend in the road to the south of Albany Farm roundabout. The advantage of this layout is that the roundabout could be designed to accommodate forecast traffic flows without the restrictions of adjacent properties. It would also be safer to build and cause less disruption than making alterations to the existing roundabout at Albany Farm. The approximate land take required is shown on **Drawing 227552JG/HCC/6007**, again subject to future capacity testing. The proposed junction location would result in the loss of a small section of TPO woodland. However, moving the junction to the north would have a significant impact on the geometry of the roundabout and the alignment on the eastern approach. A more detailed assessment of the overall impact will be required to inform a decision.

All of the horizontal radii on this route are 1100m or greater, so that no verge widening will be required. The first 600m runs downhill at a gradient of up to 4% in cutting to a maximum depth of 5.0m. The gradient then flattens off on the approach to the river, rising on an embankment up to 3.5m high before crossing the flood plain on a 180m long viaduct. To the east of the river, the route climbs back up the valley slope to the north of Spurlings Farm at a maximum gradient of 3.5%, before levelling off to a gradient of 2.0% on the approach to the north spur at Junction 11. The majority of this length is in cutting with a maximum depth of 4.5m.

The route alignment intersects one country road and three public rights of way, all of which will need to be dealt with as part of the SDA masterplan. It also passes across a site of archaeological interest, a section of the National Inventory for Woodland and Trees and a water source protection area, of which 50m is in zone 3, 1300m is in zone 2 and 700m is in zone 1.

The whole of this route alignment falls within the Chalk plain. The total volume of excavation is estimated to be 115625m<sup>3</sup>, of which 92500m<sup>3</sup> is expected to be suitable for construction of embankments. The volume of fill required for embankment construction is estimated to be 39075m<sup>3</sup>, indicating that sufficient material has been excavated to be used for the construction of embankments with 53425m<sup>2</sup> remaining for use in landscaping.

### 3.5 Option 4

The route for Option 4 is illustrated on **Drawing 227552JG/HCC/6008**. It joins the A32 at the same location as Option 3, and follows a similar alignment but passes between Spurlings Farm and Roche Court Preparatory School. The implications of avoiding the TPO woodland would be similar to Option 3. From the roundabout the route runs downhill at a 2% gradient in a shallow cutting of maximum depth 1.5m. The gradient then increases to 3.5% before levelling off to a low point near the river crossing, where the road rises on an embankment up to 4.0m high on the approach to the flood plain. The oblique crossing of the flood plain is 310m long, making this the longest viaduct of any of the options.

Once across the river, the road rises steeply on embankment up to 4.0m in height at the maximum 4% gradient. The final section is in cutting up to 3.5m deep, levelling out on the approach to the north spur at Junction 11.

The route alignment intersects two country roads and one public right of way, all of which will need to be dealt with as part of the SDA masterplan. It also passes across a site of archaeological interest, a section of the National Inventory for Woodland and Trees and a water source protection area, of which 50m is in zone 3, 1250m is in zone 2 and 900m is in zone 1.

The whole of this route alignment falls within the Chalk plain. The total volume of excavation is estimated to be 26625m<sup>3</sup>, of which 21300m<sup>3</sup> is expected to be suitable for construction of embankments. The volume of fill required for embankment construction is estimated to be 113,000m<sup>3</sup>, requiring 91700m<sup>3</sup> of additional material to be obtained either from landscaping of the surrounding area, or from import.

### 3.6 Option 5

The route for Option 5 joins the A32 at its junction with Pook Lane, as shown on **Drawing 227552JG/HCC/6012**. Initial indications are that the most suitable junction type at this location would be a double roundabout, but this is not a standard arrangement and it is likely to be difficult to achieve a safe design with sufficient capacity. A more standard arrangement would be a single conventional roundabout, but the existing geometry mitigates against this. The junction location on Option 5 is the single largest disadvantage of the route.

The horizontal alignment of Option 5 would require Departures from Standard for sub-standard curvature. The alignment was therefore modified to Option 5a, increasing the horizontal radii at either end so that Departures would not be required.

The first section of the route features a horizontal curve of 550m, with the vertical alignment sloping gently downhill at a gradient of 1% on an embankment up to 3.0m high. The route then straightens out and runs parallel to the M27, maintaining the same gradient so that the embankment reaches a maximum height of 3.5m on the approach to the river crossing. Here the viaduct curves northwards on a radius of 750m across the flood plain, which is 240m wide at this location.

East of the river, the route rises up the valley slope on a maximum gradient of 4.0%, taking land from the northern part of the Spurlings Industrial Estate. The maximum embankment height over this section would be 9.0m, making this the highest embankment on any of the routes. Over the final section, the horizontal radius tightens to 550m and the gradient flattens off on the approach to the north spur at Junction 11.

The route alignment intersects two country roads and two public rights of way, all of which will need to be dealt with as part of the SDA masterplan. It also crosses a water source protection area, of which 50m is in zone 3, 750m is in zone 2 and 1200m is in zone 1.

The whole of this route alignment falls within the Chalk plain. The total volume of excavation is estimated to be 122000m<sup>3</sup>, of which 95000m<sup>3</sup> is expected to be suitable for construction of embankments. The volume of fill required for embankment construction is estimated to be 140200m<sup>3</sup>, requiring 45200m<sup>3</sup> of additional material to be obtained either from landscaping of the surrounding area, or from import.

### 3.7 Option 6

The route for Option 6 is illustrated on **Drawing 227552JG/HCC/6014**. Similarly to Options 1 and 2, it joins the A32 at the Albany Farm roundabout, which would need to be enlarged and remodelled to convert it to a 4-arm roundabout of sufficient size to provide adequate capacity. The approximate land take required for the roundabout has been modelled for cost estimate purposes as comparable to the land take required for Option 1, but it should be stressed that this could change when traffic forecasts are available to enable capacity testing to be carried out. To avoid any land take from the Albany Business Park a departure from alignment standards is required to use a horizontal curve of 255m as the desired minimum is 360m.

The first section of the route features a horizontal curve of 255m, with the vertical alignment sloping downhill at a gradient of 3% in a cutting up to 1.5m deep. The following section continues into the cutting with a horizontal curve of 1700m before a straight section of 700m in length. The maximum depth of the cutting along the straight section of the road has is 7m.

The horizontal alignment comes off the straight in a 360m curve. The vertical alignment over this section would be in the form of a shallow sag curve with a low point near the river crossing, decreasing to a downward slope of 1% west of the river. Within this section the route intersects the Wallington River flood plain, which at this point is 240m wide. It is likely that the Environment Agency would insist on a viaduct of at least this length in order to span the floodplain

The route then continues for 300m, with a horizontal radius of 750m on an embankment up to 3.0m high, with the vertical alignment increasing to a maximum uphill gradient of 3%. The horizontal radius then changes to 550m over the final 190m taking land from the northern part of the Spurlings Industrial Estate, which is on a small embankment of up to 0.5m. The vertical alignment increases to 4% and connects with the north spur at Junction 11.

The route alignment intersects two country roads and two public rights of way, all of which will need to be dealt with as part of the SDA masterplan. It also passes through a water source protection area, of which 50m is in zone 3, 2330m is in zone 2 and 1200m is in zone 1.

The whole of this route alignment falls within the Chalk plain. The total volume of excavation is estimated to be 238,650m<sup>3</sup>, of which 190,925m<sup>3</sup> is expected to be suitable for construction of embankments. The volume of fill required for embankment construction is estimated to be 183,000m<sup>3</sup>, requiring 7925m<sup>3</sup> of the material to be disposed of through landscaping of the surrounding area.

### **3.8 Option 7**

The route for Option 7, shown on **Drawing 227552JG/HCC/6015**, joins the A32 at a new roundabout on the bend in the road to the south of Albany Farm roundabout. The route follows a similar route to Option 4, but passes to the south of North Fareham Farm.

The first 440m runs downhill at a gradient of up to 2% on an embankment up to 1.5m high. The route then continues on a straight horizontal alignment into a cutting up to a maximum depth of 7m. The gradient then flattens off on the approach to the river, rising on embankment with a maximum height of 5.0m high before crossing the flood plain on a 240m long viaduct. To the east of the river, the route climbs back up the valley slope to the north of Spurlings Farm at a maximum gradient of 4.0% on the approach to the north spur at Junction 11. The majority of this length is on an embankment with a maximum height of 3.5m.

The route alignment intersects two country roads and two public rights of way, all of which will need to be dealt with as part of the SDA master plan. It also passes through a section of the National Inventory for Woodland and Trees and a water source protection area, of which 50m is in zone 3, 1660m is in zone 2 and 1200m is in zone 1.

The whole of this route alignment falls within the Chalk plain. The total volume of excavation is estimated to be 103,300m<sup>3</sup>, of which 82,600m<sup>3</sup> is expected to be suitable for construction of embankments. The volume of fill required for embankment construction is estimated to be 117,800m<sup>3</sup>, requiring 435,200m<sup>3</sup> of additional material to be obtained either from landscaping of the surrounding area, or from import.

**Table 3.1: Table to Compare the A32 Route Realignment Options**

	<b>Considerations</b>	Option 1	Option 2	Option 3	Option 4	Option 5(a)	Option 6	Option 7
Geometry	Route length	3075	2425	2030	2210	1960	2925	2475
	Minimum Horizontal Curvature (m)	1100	1100	1100	1700	550		
Earthworks	Total Cut made (m <sup>3</sup> )	128,125	52,550	115,525	26,625	122,000	238,650	103,300
	Total Cut available for use in embankments (m <sup>3</sup> )	80,575	35,950	92,500	21,300	95,000	190,925	82,600
	Total Fill required for embankment construction (m <sup>3</sup> )	63,150	71,550	39,075	113,000	140,200	183,000	117,800
	Earthworks Balance (m <sup>3</sup> )	17,425 surplus	34,600 import	53,425 surplus	91,700 import	45,200 import	7,925 surplus	35,200 import
Land take	Land take for road (m <sup>2</sup> )	110,000	80,000	74,500	79,000	68,000	119,475	96,200
	Land take for new junction (m <sup>2</sup> )	5,650	6,150	6,750	6,750	7,700	6,000	6,750
	Total Land Take (m <sup>2</sup> )	115,650	86,150	81,250	85,750	75,700	125,475	102,950
Junction on A32 Wickham Road	Junction layout	Extension of existing roundabout	Extension of existing roundabout	New roundabout	New roundabout	New double roundabout	Extension of existing roundabout	New roundabout
	Implications	Potential lack of capacity, disruption during construction and loss of industrial park.	Potential lack of capacity, disruption during construction and loss of industrial park.	Potential to access land to west of A32 with a fourth arm on the roundabout.	Potential to access land to west of A32 with a fourth arm on the roundabout.	Safety and capacity concerns. Significant disruption during construction.	Potential lack of capacity, disruption during construction and loss of industrial park.	Potential to access land to west of A32 with a fourth arm on the roundabout.
Viaduct	Viaduct Length (m)	300	200	180	310	240	240	240
Constraints	Intersections with public rights of way	3	3	3	1	2	1	1
	Intersections with country roads	2	1	1	2	2	2	2
	Water Source Protection Zone	200m in zone I 2500m in zone II 400m in zone III	700m in zone I 1400m in zone II 350m in zone III	700m in zone I 1300m in zone II 50m in zone III	900m in zone I 1250m in zone II 50m in zone III	1200m in zone I 750m in zone II 50m in zone III	1200m in zone I 2330m in zone II 50m in zone III	1200m in zone I 1660m in zone II 50m in zone III
	Crosses site of archaeological interest		X	X	X			
	Crosses section of National Inventory for Woodland and Trees			X	X			X
	Existing Services	Route conflicts with HV Overhead Electricity Cables					Route conflicts with Gas Network	Route conflicts with Gas Network

## 4 COST COMPARISON

For each option set out in Chapter 3 a rough order of cost was estimated. This work was undertaken by Franklin & Andrews based in their Sheffield office. This work was to determine the order of magnitude costs for each option and allows the comparison between each option. However, this estimate was undertaken on basic information with a high level of risk. Therefore, it is proposed that an Optimism Bias of 65% in line with the recommendation of the “Green Book” published by HM Treasury.

When undertaking the initial cost estimate several factors were unknown and were excluded from the estimate. The following items were not included: V.A.T.; professional fees; land and compensation costs; landscaping; accommodation works; service diversions; Statutory Undertakings; CCTV; major road land drainage modifications; and design.

	Option 1	Option 2	Option 3	Option 4	Option 5	Option 6	Option 7
Cost	£23,736,511	£18,086,440	£15,572,454	£25,759,946	£24,592,393	£16,763,168	£23,823,861
Optimism Bias	£15,428,733	£11,756,186	£10,122,095	£16,743,965	£15,985,056	£16,763,168	£15,485,510
Rounded Total	£39,170,000	£29,850,000	£25,700,000	£42,510,000	£40,580,000	£32,580,000	£39,310,000

**Table 4.1: Rough Order of Cost Estimates**

These estimates were based on Q3 2008 prices. Reviewing the costs, there is the scope for Value Engineering and Value Management on all the options. Options 1 and 4 have relatively expensive viaduct due to their length. Through further design, the alignment of the viaduct for these options could be more perpendicular to the flood plain; by reducing the viaducts length, hence its cost.

Option 5 is also relatively expensive due to several factors fill import. This option runs perpendicular to valley, which falls steeper than the minimum gradient requiring fill for the difference. It also crosses the flood plain at the widest point which means it requires a long viaduct.

## **5 CONCLUSION**

This study identifies a number of options to link the A32 with Junction 11 and allows comparisons to be made between the different route options. There are clearly positive and negative aspects to each of the approaches and the final solution is dependant on the combination of other factors such as land requirement, density, development form, land availability and the amount of development.

The recommendation is that a further analysis, of greater depth, is required as part of the future master planning process.