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To The Chairman and Members of the Local Plan Working Group

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Date	22 October 2013

AGENDA SUPPLEMENT (1) – APPENDIX D/PART 1

Dear Sir/Madam

LOCAL PLAN WORKING GROUP - TUESDAY 29 OCTOBER 2013

I refer to the agenda for the above-mentioned meeting and enclose the following items:

Item No	Report Title	Page Nos
8.	Attleborough Link Road Study - Appendix D/Part 1 Report by Phil Mileham, Deputy Planning Manager. Unfortunately, due to the size of Appendix D, I have had to split the document into 9 parts – this is part 1 of 9. NB: There will be a limited number of hard copies available on the day.	1 - 129

Yours faithfully

Julie Britton

Senior Committee Officer

CAPITA SYMONDS

Attleborough Link Road Concept Options Report

Final Report | July 2013

CAPITA SYMONDS

Project No: CS/060268 Doc Ref: CS/060268 Rev:

Client: Breckland Council
Issue Date: July 2013

Attleborough Link Road
Concept Options Report | Final Report






	Name	Signature	Date
Author	D E Bennett		22/07/2013
Checker	D H James		22/07/2013
Approver	D H James		22/07/2013

Issue Record

Rev	Date	Description/Comments	Author/Prepared by:	Approved for Issue by:

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Glossary of Terms / Abbreviations

AADT	Annual Average Daily Traffic
AAP	Area Action Plan
ANPR	Automatic number Plate Recognition
ARCADY	Assessment of Roundabout Capacity And DelaY
ASHAAP	Attleborough and Snetterton Area Action Plan
ATC	Automatic Traffic Counts
COBA	Cost Benefit Analysis
CWS	County Wildlife Sites
DDA	Disability Discrimination Act
Design Speed	Used to determine geometric features of a new road during road design.
DMRB	Design Manual for Roads and Bridges
HGV	Heavy Good Vehicles
Horizontal Alignment	Consists of straight sections of road, known as tangents, connected by horizontal curves
NTM	National Transport Model
Paramics	A microsimulation model.
RFC	Ratio of flow to capacity
SAC	Special Area of Conservation
Sag curve	A curve which, when viewed from the side, is concave upwards
SSSI	Site of Special Scientific Interest
TEMPRO	Trip End Model Presentation Program
TRL	Transport Research Laboratory
VP	View Points
WebTAG	Department for Transport's multimodal guidance on appraising transport projects and proposals

1. Introduction

Capita Symonds was commissioned by Breckland Council in August 2012 to undertake three transport studies relating to Attleborough. The studies are as follows:

- Attleborough and Snetterton Heath Smarter Choices;
- Attleborough Town Centre Improvements; and
- Attleborough Link Road.

The adopted Core Strategy identified Attleborough for an expansion of 4000 homes and 10 hectares of employment land with the further release of 20 hectares of employment land at Snetterton Heath. Breckland Council had previously begun preparing an Attleborough and Snetterton Area Action Plan (ASHAAP) to identify the precise location of the growth. In 2013, the Council resolved to cease preparing a separate Area Action Plan (AAP) and instead identify the detailed proposals for Attleborough and Snetterton as part of a new single Local Plan document.

Figure 1.1 shows all the potential development areas to the south of Attleborough that resulted from the Breckland Council *Call for Sites* in 2008 whilst Figure1.2 shows the ASHAAP boundary. It should be noted that the two boundaries are not coincident.

Associated with these proposals are improvements to sustainable transport, highway improvements in the town centre and a new link road to the south of the town. The third of these is the subject of this report and the technical evidence that it contains will inform the policy approach in the Area Action Plan. It will also provide a detailed report to support the policy requirement for a link road associated with growth. The study will also inform the Smarter Choices and Town Centre Improvement studies.

2. Relevant Information and Previous Work/Studies

There is much background information that is relevant to the study in the form of documents produced by Breckland Council and others. Previous work includes studies undertaken either for the development of Attleborough, a proposed Attleborough Link Road, or both combined. The main documents and studies are listed below in chronological order.

2.1 Attleborough Proposed Link Road Solutions – Route Identification Study (Mott MacDonalds 2008)

This considered options for a link road to allow the strategic growth of the town. Options were based on a development scenario that included 4000 houses to the south of the Cambridge to Norwich railway line, 500 houses between the A11 Trunk Road and the railway, employment land at London Road, and a supermarket and three schools (including a high school) to the south of the railway.

The study led to the identification of 18 link options; 4 to the east of the town, six to the west, and 8 combined.

2.2 Breckland Local Development Framework - Core Strategy and Development Control Policies Development Plan Document (2009)

This document sets a spatial vision for the Breckland area with clear economic, social and environmental objectives. It also considers the needs and aspirations of Breckland Residents, and seeks to achieve an integrated approach to regeneration and delivery of needed development.

2.3 Attleborough Vision (Ptarmigan Land/Bidwells/ John Thompson & Partners, 2010)

This included the results of the Attleborough Community Planning Weekend held in February 2010, during which the residents were given the opportunity to express how they would like to see the town develop in the future. This included transport issues and the problems of congestion and HGVs in the town centre were highlighted. A link road and cycle links were also identified with the preference for the former to commence at Bunn's Bank.

Also in 2010, Bidwells carried out a Transport Strategy Scoping Report on land to the south of Attleborough.

2.4 ATTLEBOROUGH AND SNETTERTON HEATH AREA ACTION PLAN ISSUES AND OPTIONS (BRECKLAND COUNCIL, 2010)

This identified the issues and options over a wider area than just Attleborough. However, the need to ease traffic problems in the town centre had already been highlighted and a new link road to the south west was deemed a critical priority. A large number of questions were developed to ascertain the public's opinion on various issues, including transport. These included the following topics with the question numbers in brackets:

- Traffic priorities to ease town centre traffic congestion (Q17);
- How to get more people cycling and using buses (Q18);
- Cycle parking (Q19);
- Cycle routes between Attleborough and Snetterton Heath (Q20);
- Walking and cycling links between the proposed new developments and the town (Q21);
- Walking and cycling links to surrounding areas (Q22); and
- Routing options for the link road (Q26).

Responses were gathered from young people, the general public, stakeholders and included a householder questionnaire.

2.5 ATTLEBOROUGH STRATEGIC MASTERPLAN, FINAL MASTERPLAN REPORT (URS SCOTT WILSON, FEBRUARY 2011)

This identified areas to the south west and south east of the town for future development. In addition, it identified locations where both a complete east/west and west-only link road could be located to serve both the needs of the development and traffic wishing to avoid the congested town centre. The link road to the west formed the basis of the Preferred Option in the Attleborough Transport Topic Paper Draft.

2.6 ATTLEBOROUGH TRANSPORT TOPIC PAPER DRAFT (BRECKLAND COUNCIL, FEBRUARY 2012)

This document included a summary of the Mott McDonald work and a Preferred Option, with a Link Road to the south west of the town with variations in its connection with the B1077 was identified. As well as taking into account the Mott McDonald work, the Preferred Option was based on the principles in the URS Scott Wilson Masterplan 2011 and is referential to a preliminary Masterplan prepared for Ptarmigan (Attleborough Land Ltd) by John Thompson and Partners.

2.7 SIGNIFICANT PLANNING APPLICATIONS

A Planning Application for the erection of 375 dwellings with associated parking, garages and landscaping was refused in July 2012. The site was bounded by London Road and the railway, and West Carr Road and Hillsend Lane. The reasons for its refusal were that the development fell outside the Settlement Boundary for Attleborough as defined in Breckland Council's Core Strategy and Development Control Policies DPD. The release of housing land was to be managed through the Attleborough and Snetterton Heath Area Action Plan. In addition, it was considered that the traffic implications of the development had not been fully assessed. A revised Planning Application was submitted in September 2012, which was supported by a Transport Assessment and a Design and Access Statement. This was granted on 20 December 2012.

3. This Study

This study takes all the previous work that has been undertaken (outlined above) as a starting point and further develops concept design options to provide a Link Road between London Road and the B1077 Attleborough Road, to the south of the town. Link Road options to the east and combined options to the east and west have been discounted in the Draft Attleborough Transport Topic Paper for a number of reasons including the environmental impact on a Grade 1 listed church and the cost of providing upgrades to the A11 junction at Besthorpe, which will be up to £15 million and as a result will be undeliverable.

As well as providing highway access to the identified proposals from the emerging Local Plan, it is Breckland Council's intention that the Link Road will be used as a means of avoiding the gyratory system in Attleborough town centre for journeys between the A11 Trunk Road and the B1077 Buckenham Road/Attleborough Road.

The study takes into account agreed development scenarios to the south of Attleborough and relates these to the concept design options, where appropriate.

Stage 1 assessment allows the identification of environmental, engineering, economic and traffic advantages, disadvantages and constraints associated with broadly defined improvement strategies.

Stage 2 assessment allows the identification of the factors to be taken into account in choosing alternative routes or improvement schemes and to identify the environmental, engineering, economic and traffic advantages, disadvantages and constraints associated with those routes and schemes.

The previous work carried out by Mott McDonald in 2008 was similar in some respects to a Stage 1 assessment. Even though options were identified, which are the basis of this study, that suggest a Stage 2 assessment is appropriate, there are aspects of Stage 1 assessment that have to be considered in more detail before a preferred link road option can be identified. The stage of assessment that has been undertaken in this study is based on Stage 1/2. It should be noted that no economic assessment has been carried out on any of the Link Road options.

4. The Existing Situation

(Drawing Number CS/060268-01)

4.1 The Highway Network

Attleborough lies approximately 23 kilometres to the south west of Norwich. It has been bypassed to the north by the A11 Trunk Road dual carriageway. There are three links between the A11 and Attleborough; one to the north east, one to the north and one to the south west of the town. The latter link (at Breckland Lodge) is London Road (C582) and this runs approximately parallel to the A11 towards the centre of the town. The road is flanked by verges. London Road is derestricted from Breckland Lodge to south of Haverscroft Industrial Estate where it changes to 40mph. This reduces to 30mph where the built-up part of Attleborough is on both sides of the road.

Attleborough town centre has a large gyratory system all of which is the B1077. From the town centre, the B1077 goes south, initially as Station Road but becoming Buckenham Road close to the southern edge of the town. The B1077 remains as Buckenham Road until it reaches the Bunn's Bank Road junction from where it becomes Attleborough Road. Bunn's Bank Road gives access to an industrial area and is a 20mph zone. The B1077 continues south, passing through Old Buckenham and eventually on to Diss. This road also links to the A11 to the north of Attleborough. The speed limit on Buckenham Road changes mid way between Foundry Corner and Bunn's Bank Road. To the north it is 40mph and to the south derestricted (60mph).

There are two minor roads that also run approximately parallel to the A11 and London Road. Hargham Road (C153) lies between London Road and the Cambridge to Norwich railway line and Leys Lane lies further east. Hargham Road has a junction with London Road close to Attleborough town centre whereas Leys Lane/Slough Lane has a junction with the B1077 approximately one kilometre to the south of it. Both roads are very narrow with Leys Lane having a poorer horizontal alignment, particularly at its northern end. Hargham Road has a 40mph speed limit north of Portmere Farm and is derestricted (60mph) to the south. Leys Lane is also derestricted.

There are east west connections between the A11, London Road, Leys Lane and the B1077 Buckenham Road/Attleborough Road, both of which have level crossings at the railway. There are also roads that connect some of them. The one between the A11/London Road junction and Puddledock includes some extremely substandard lanes and tracks and is unlikely to be used by vehicles passing between the above two roads. It is approximately 5.7 kilometres in length. Further south, there is a higher standard direct link between the two roads, which starts at the A11 junction 1.8 kilometres to the south of the Breckland Lodge junction. This is also Hargham Road (the C138) and it meets the B1077 Attleborough Road at Old Buckenham. This link is approximately 5.4 kilometres in length. Of the two east west links, the latter may well be used for access between the A11 and the B1077 to the south of Attleborough although weight restrictions at the western end and at the eastern end in Old Buckenham mean that it is not available to Heavy Goods Vehicles associated with Bunn's Bank Industrial Estate. However, flows are low with the Annual Average Daily Traffic (AADT) flow in the region of 1200 vehicles (two way) at the eastern end in the vicinity of Old Buckenham.

In addition to the above, there are links between some of the above north south roads. In particular, New Road connects London Road with Hargham Road at Haverscroft Industrial Estate.

4.1.1 *Public Transport (Bus)*

Bus stops are confined to the built-up area of Attleborough and are associated with services to and from Norwich run by First Group and the Go-Ahead Group (Konnectbus). This area includes the urban northern sections of London Road and Hargham Road. On the B1077 the closest bus stops to the town centre are located in the northern and southern parts of Old Buckenham. However, none of these are associated with direct services to and from Attleborough and there are no bus stops in the vicinity of Attleborough train station.

4.1.2 *Provision for Cyclists*

There are no cycle facilities to the south of Attleborough. Within the town there is a shared use facility on the east side of the B1077 Station Road, which continues into Surrogate Street (part of the gyratory system) and Norwich Road. This effectively links Attleborough train station with Attleborough Junior and High Schools. This was completed in early 2011.

There are no new cycle facilities proposed within the next five years.

4.1.3 *Provision for Pedestrians*

There are no footways adjacent to London Road other than a short section associated with the recently constructed access road into the General Development Area close to Haverscroft Industrial Estate. The section of Buckenham Road to the north and south of the Borough Lane junction at Foundry Corner has a 1.5 metre wide footway on its east side only, the more southerly section of which was constructed in late 2011. There are no footways alongside the B1077 Attleborough Road further south. Neither Hargham Road nor Leys Lane have any footways associated with them.

There is a gated pedestrian crossing of the railway on Leys Lane where it goes from a rural to an urban part of Attleborough. It is understood that this is well used partly due to the proximity of Gaymers Industrial estate to the immediate east.

4.1.4 *Collision Data*

Collision data has been supplied by Norfolk County Council and covers the five year period between 1 July 2007 and 30 June 2012. Although the data covers all the roads in Attleborough and its immediate surroundings, only those on roads that are in the vicinity of link road options have been included in Table 4.1 below.

Ref. No./Date	Location	Severity	Details
25 0066 190	London Road at northern boundary of garden centre	Serious	Motorcycle collided with turning coach following an overtaking manoeuvre
30 4700 7	Junction of London Road/ New Road	Slight	Vehicle turning right from minor road failed to give way to vehicle on major road
26 0052 299	Junction of Hargham Road/ Minor road (33128) from London Road	Slight	Two cars travelling in opposite directions collided with each other
27 0059 056	Junction of Hargham Road/ Minor road (33128) from London Road	Slight	Two cars travelling in opposite directions collided with each other
40 0052 101	Junction of Hargham Road/ New Road	Slight	Motorcycle lost control whilst turning right and collided with vehicle
42 T090 200	Junction of Hargham Road/ New Road	Slight	Vehicle hit stationary vehicle waiting to turn
33 0065 417	Hargham Road	Slight	No defining details available
89 0057 567	Junction of B1077 Buckenham Road/ Borough Lane	Slight	No defining details available

Table 4.1 Collision Data

4.2 THE LOCAL AREA

4.2.1 GENERAL

In common with many parts of Norfolk, the Attleborough area is relatively flat with minimal elevation changes. It is due to this flatness that the large majority of roads and lanes that cross the Cambridge to Norwich railway have either manually operated or signal controlled gates. This includes Fowler's Lane/Poplar Road, which gives access to residential properties and farms (Poplar Farm and Alder Farm) on the southern outskirts of Attleborough. Of the two roads, the southern section of Fowler's Lane is little more than a rough track, which suggests that most access to the properties that these roads serve is from the north. At its closest, Poplar Road lies approximately 75 metres east of the railway.

There are a number of groups of properties, both residential and business as well as those of an individual nature to the south of Attleborough. On London Road, close to the A11 junction there is a hotel/public house (Breckland Lodge/The Stag), a public house (White Lodge) and a Roses Nursery/Garden Centre (Peter Beales/Sweet Briar). Closer to Attleborough town centre is Haverscroft House Farm and Haverscroft Industrial Estate. A proposed General Employment Area (Victory Park) is located to the immediate south west of this.

On Hargham Road, there are individual properties and farms including Portmere Farm, Haverscroft Farm, and Haverscroft House. On Leys Lane, these include Leys Farm, Leys Cottages, Harvey Coachbuilders, Fine Furniture Exports, Dockings Farm (from Slough Lane), and a caravan site. On the B1077 Buckenham Road/Attleborough Road there are groups of residential properties at Foundry Corner, a number of companies including those engaged in poultry on Bunn's Bank Road (Bunn's Bank Industrial Estate) and Scrublands Farm. As well as Bunn's Bank Industrial Estate, the other area of a similar nature is Gaymers Industrial Estate, which is accessed from the B1077 Station Road approximately 230 metres south of the train station.

As well as the roads described earlier, there are a number of tracks, which pass east west through the area. These include an extension of Fowler's Lane east from Poplar Road to Leys Lane and an unnamed track from Leys Lane to the B1077 Buckenham Road/Attleborough Road at Bunn's Bank Road. Adjacent to the latter are the remains of a former sewage works. Another former sewage works is located close to Poplar Road.

There are a number of woodland areas to the south of Attleborough. However, most of these are small with the only ones of any significant size being Leys Plantation and Hargham Heath. The former straddles the railway.

The only watercourses that pass through the area are minor. Some pass through the above woodland areas and one passes to the north of Old Buckenham Fen, a Site of Special Scientific Interest (SSSI) at Old Buckenham, which is shown on the Constraints Plan (CS/060268-02). There are a number of ponds in the area, some of which were former quarries.

Part of the area to the south of Attleborough is within a flood zone. The Hargham Heath/Leys Plantation area is within a 1 in 100 year zone and this extends north east each side of the railway to immediately south of Poplar Road. A further area is located west of Puddledock. The flood zones are shown on the Constraints Plan.

Further details of some of the above features of the local area can be found Sections 15.0, 16.0, and 17.0.

There are significant areas of identified sand and gravel resources within the area to the south of Attleborough and Policy CS16 of the Norfolk County Council Minerals and Waste Core Strategy refers to this. It is likely that these resources will be available for the construction of the Link Road as well as the development.

4.2.2 PUBLIC RIGHTS OF WAY

There are few Public Rights of Way passing through the area. However, the most prominent one, the Tas Valley Way (a Long Distance Path) follows Hargham Road from close to the centre of Attleborough before passing through Hargham Heath before reaching Old Buckenham. Fowler's Lane/Poplar Road is a Bridleway and a Public Footpath links Poplar Road with Leys Lane. A short Bridleway follows the access track to Haverscroft House Farm from London Road and a Public Footpath follows the southern boundary of Bunn's Bank Scheduled Monument.

4.2.3 *Land Classifications and Environmental Stewardship*

The majority of land to the south of Attleborough and bounded by the A11 Trunk Road to the west and the B1077 Buckenham Road/Attleborough Road to the east is Agricultural Grade 3. However, immediately to the east of the railway and west of Hargham Road is an area of Grade 4 agricultural land, which extends south and east towards Old Buckenham. The whole of the built up area of Attleborough is classed as Urban. Agricultural land grades are shown on Figure 4.1.

Environmental Stewardship is an agri-environmental scheme that encourages farming practices that are beneficial to biodiversity as well as providing for biodiversity by encouraging effective land management. Much of the area to the south of Attleborough is covered by Environmental Stewardship Agreements, which are shown on Figure 4.2.

4.2.4 *Land Ownership*

Land ownerships are shown on Figure 4.3. The majority of the land that lies between the Cambridge to Norwich railway and the B1077 Attleborough Road is within the ownership of Leys Farm and this extends as far north as Fine Furniture Exports on the southern outskirts of Attleborough. To the immediate east of the railway, apart from individual properties, the majority of land is within Poplar Farm. Between the northern boundary of Leys Farm and the railway, land is within Plantation Farm. Between Fine Furniture Exports and the B1077 Buckenham Road, land is either within Docking Farm, or further east, or is held by Syrett Land Holdings.

4.2.5 *Statutory Undertakers*

The Geotechnical Preliminary Sources (Desk) Study, Appendix C includes some information on BT utilities. Further information has been sought from other utilities' companies. All available information, unless otherwise stated, is shown on the Constraints Plan, Drawing Number CS/060268/02. In total, information has been sought from the following sources:

- BT;
- Network Rail;
- National Grid;
- Norfolk County Council;
- UK Power Networks;
- Virgin Media;
- Midland Water;
- Instalcom;
- Cable and Wireless; and

- Interoute.

4.2.6 BT

BT has services in the vicinity of Hargham Road, Fowler's Lane and Poplar Road in the west of the study area. There are also services close to Leys Lane in the central area as well as adjacent to the B1077 Buckenham Road and Attleborough Road, in the east. These extend into Bunn's Bank. BT plans can be found in Appendix E: Preliminary Sources Desk Study as well as on the Constraints Plan, Drawing Number CS/060268/02.

4.2.7 NETWORK RAIL

Although Network Rail responded to the enquiry, no specific information on underground assets was provided.

4.2.8 NATIONAL GRID

National Grid has underground services passing through the central part of the development site to the south of Attleborough. Specifically, these are Local High Pressure mains.

4.2.9 NORFOLK COUNTY COUNCIL

Norfolk County Council has street lighting columns in the vicinity of London Road/New Road, Foundry Corner and Breckland Lodge Roundabout. These have been omitted from the Constraints Plan.

4.2.10 UK POWER NETWORKS

Information is awaited

4.2.11 VIRGIN MEDIA

Information is awaited

4.2.12 MIDLAND WATER

Information is awaited

4.2.13 INSTALCOM

Instalcom has no utilities in the area

4.2.14 CABLE AND WIRELESS

Cable and Wireless has no utilities in the area

4.2.15 INTEROUTE

Interoute has no utilities in the area

4.3 TRAFFIC

To estimate traffic flows on the proposed link road and associated junctions to inform the design process, both existing traffic flows need to be measured and future traffic flows calculated. All traffic data is found in Appendix A: Existing Traffic Flows.

Existing traffic survey information has been provided via various sources including previous reports, the Highways Agency and Norfolk County Council. This data includes numerous automatic traffic counts (ATC), an Automatic Number Plate Recognition (ANPR) survey of the town centre gyratory, journey time surveys and various junction classified counts, which are summarised below:

4.3.1 ATC DATA FROM NORFOLK COUNTY COUNCIL

- C136 Long Street Gt Ellingham between U33112 & C137: 6-12th September 2007
- B1077 Attleborough Road Gt Ellingham: 1st January 2011 to 1st January 2012
- B1077 Connaught Road Attleborough between U31142 & U33145 (Westbound): 24th-30th January 2009
- B1077 Buckenham Road Attleborough between U33127 & U33089: 21st – 20th February 2009
- A11 Besthorpe Bypass: 1st January 2010 to 1st January 2011
- C138 Hargham Road Old Buckenham between U33083 & U33088 (CP1) 12th February 2003 to 12th March 2003
- C138 Hargham Road Old Buckenham between U33083 & U33088 (CP2) 12th February 2003 to 12th March 2003
- C138 Hargham Road Quidenham between A11 & C153 7th February 2003 to 19th February 2003
- C138 Hargham Road Quidenham between A11 & C153 14th May 2003 to 4th June 2003
- C138 Hargham Road Quidenham between A11 & C153 2nd to15th July 2004

4.3.2 ATC DATA FROM HIGHWAYS AGENCY: MARCH 2012

- A11 Between B1077 & B1172 (NE Besthorpe)
- Norwich Road (A11 on slip - Attleborough)
- Norwich Road (A11 off slip - Mill Lane)
- Deopham Road (North of A11 on slip)
- Mill Lane, Besthorpe
- Ellingham Road (Deopham Road- Warrens Lane)
- Queens Road (A11 off slip- Queens Court)
- Silver Street (Besthorpe), east of White Horse Lane
- Station Road (Connaught Road- New North Road)
- West Carr Road (East of Long Street, South of Walnut Tree Farm)
- Wroo Road, between Swangey Lane and A11
- B1077 London Road (East of A11, West of Fen Street)

4.3.3 12 HOUR MANUAL CLASSIFIED COUNT FROM NORFOLK COUNTY COUNCIL

- C572 London Road between U31043 Sheppard Way and U33365 St Edmund's Gate 27th June 2008

4.3.4 12 HOUR MANUAL CLASSIFIED COUNTS FROM BIDWELLS

- B1077 Station Rd: 10th December 2010
- B1077 Station Rd, Level Crossing Study: 10th December 2010

4.3.5 PEAK HOUR JUNCTION CLASSIFIED COUNTS FROM BIDWELLS

- Norwich Road / A11 On slip: 0700-0900 / 1630-1830 hours 10th October 2007
- Norwich Road / A11 Off slip: 0700-0900 / 1630-1830 hours 10th October 2007
- Queens Road / A41 Slips (Northside): 0700-0900 / 1630-1830 hours 10th October 2007
- Deopham Road / A41 Slips: 0700-0900 / 1630-1830 hours 10th October 2007
- Queens Road / A41 Slips (Southside): 0700-0900 / 1630-1830 hours 10th October 2007

- Blackthorn Road / A41 Slips: 0700-0900 / 1630-1830 hours 10th October 2007
- A11 / London Road / Quarry Area: 0700-0900 / 1630-1830 hours 10th October 2007
- Northwich Road / Besthorpe Road / Surrogate Street: 0700-0900 / 1630-1830 hours 10th October 2007
- Thieves Lane / Surrogate Street / Station Road: 0700-0900 / 1630-1830 hours 10th October 2007
- Connaught Road / High Street / Exchange Street: 0700-0900 / 1630-1830 hours 10th October 2007
- Queens Road / Exchange Street / Church Street: 0700-0900 / 1630-1830 hours 10th October 2007

4.3.6 CLASSIFIED TURNING COUNT SURVEYS

- London Road / A11: 28th October 2010
- Dodds Road / London Road: 28th October 2010
- High Street / Connaught Street: 28th October 2010

4.3.7 ANPR SURVEY IN ATTLEBOROUGH TOWN CENTRE PROVIDED VIA BIDWELLS: 0700-1000 AND 1600-1815 HOURS 7TH OCTOBER 2009

- B1077 Queens Road
- Queens Square Car Park
- Norwich Road
- Besthorpe Road
- Thieves Lane
- B1077 Station Road
- High Street

4.3.8 JOURNEY TIME SURVEYS VIA THE HIGHWAY AGENCY: 0700-0900 / 1000-1500 / 1600-1800 HOURS 6TH MARCH 2012 / 6TH MAY 2012 / 6TH SEPTEMBER 2012

- A11 running between Hargham Road and just south of the Besthorpe junction (Scheme route)
- Running through Attleborough between London Road/ Fen Roundabout with A11 to Besthorpe junction

- Running through Attleborough across the A11 corridor from Station Road/ New North Road to Ellingham Road/ Warrens Lane

- Running from the centre of Attleborough onto the A11 and continuing to the Fen junction with London Road

A review of previous Transport Studies and associated traffic surveys has also been undertaken. This included *Attleborough Proposed Link Solutions: Route Identification Study* by Mott MacDonald (2008).

The existing traffic information provides details of traffic flows on many links within Attleborough but minimal information, except on the gyratory, of routing patterns. Information on routing patterns enables reassignment onto new links to be undertaken more accurately as part/all of the route a vehicle is taking is known. A traffic count on a road just provides flow information by direction but no data on where that vehicle has travelled from or where it is going. Without routing information, there is significant lack of data on which to base the reassignment of traffic onto the link road and to quantify the reduction in traffic in the town centre.

Based on this existing information, there was insufficient evidence to assess and develop the link road proposals. Therefore, the following traffic flow surveys have been undertaken:

4.3.9 *CLASSIFIED LINK COUNTS (TO REVIEW THE JUNCTION TYPE OF ANY CONNECTION INTO THE PROPOSED LINK ROAD):*

- Hargham Road: 27th November 2012

- Leys Lane: 27th November 2012

4.3.10 *AUTOMATIC NUMBER PLATE RECOGNITION (ANPR) SURVEYS - TUESDAY 27TH NOVEMBER 2012*

The survey periods were 0730-0930 and 1530-1730 hours (to take into account Attleborough High School and Sixth Form Centre opening times of 08:55 – 15:40 hours). The results are in 15 minute survey intervals with classifications consisting of Cars, LGV, OGV1, OGV2 and PSV. The surveys were undertaken utilising high mast camera

The ANPR surveys were undertaken at the following locations (as per the following screen shot)

- A11 South of Breckland Lodge Roundabout

- Attleborough Road (north of A11)

- High Street (adjacent to gyratory)

- Queen's Road (adjacent to gyratory)

- Norwich Road (adjacent to gyratory)

- Station Road (adjacent to gyratory)
- A11 North of Norwich Road
- B1077 (North of Bunn's Bank Road)

Figure 4.4 ANPR Survey Locations

The results of the surveys are contained in Appendix A.

4.3.11 JOURNEY TIME SURVEYS

Journey time surveys were undertaken on:

- 4th September 2012 1700-1800 hours
- 5th September 2012 0800-0900 / 1300-1400 hours
- From A11 London Rd via Exchange St / Church St / Surrogate St onto B1077 to Bunn's Bank
- B1077 at Bunns Bank through Attleborough via Connaught Road onto London Rd and the A11

- Links from Attleborough Gyratory to/from A11 to the North

The results of the surveys are contained in Appendix A.

As these September surveys were carried out during the school holidays, the journey time surveys undertaken on behalf of the Highways Agency in 2012 were utilised in the Paramics model.

5. Aims of the Link Road

The overall objectives for the Link Road are as follows:

- To cater for traffic generated by the proposed development to the south of Attleborough;
- To reduce traffic impact in Attleborough town centre;
- To act as a diversionary route for traffic between London Road and the B1077 (and vice versa);
- To provide a more appropriate means of access to and from Bunn's Bank and Gaymers Industrial Estates in relation to the wider highway network;
- To function as an integrated public transport route; and
- To provide *street-like* road characteristics to the east and *link road-link* road characteristics to the west.

As the Link Road is intended to operate as a means of access between the development and the local highway network (and vice versa), it has been the intention that its characteristics will be different throughout its length. Its western section, including that which will cross the railway, will be generally capable of higher traffic speeds, which will be beneficial for its role of attracting traffic away from Attleborough town centre. Its eastern section, which will pass through the main development area, will serve the development and will be the focus of an integrated public transport route. As a result, it characteristics will be more *street-like* although continuing to be attractive for traffic wishing to avoid the town centre. This will reduce the overall cost of the Link Road to the development. Further details on *street-like* and *link road-like* characteristics can be found in sub section 10.7.

Terminal junctions will give appropriate connections with the local highway network. The minor roads that pass through the area to the south of the town will be integrated in an appropriate manner and this report advises on how this can be best achieved and their future function.

Although it is the intention that the Link Road will link London Road in the west with the B1077 in the east, it may be appropriate given the scale of the overall development and the fact that it will not be constructed in one go, to phase it's construction. The implications of this are discussed in each of the concept design options.

6. Highway Standards

The Design Manual for Roads and Bridges (DMRB) Volumes 5 and 6, Assessment of Road Schemes and Road Geometry respectively have been used to determine the option standards. In addition, other documents have been used in option development. All documents are listed below:

- TA46/97: Economic Assessment and Recommended Flow Ranges for New Rural Road Links;
- TD9/93: Highway Link Design;
- TD27/05: Cross sections and Headroom;
- TD16/07: Geometric Design of Roundabouts;
- TD42/95: Geometric Design of Major/Minor Priority Junctions;
- TD69/07: The Location and Layout of Lay-bys and Rest Areas;
- TA57/87: Roadside Features;
- TA90/05: The Geometric Design of Pedestrian, Cycle and Equestrian Routes; and
- LTN 1/12: Shared Use Routes for Pedestrians and Cyclists.

7. Design Speed

The design of a new highway starts with the selection of a Design Speed. This has been carried out for the Link Road and in accordance with DMRB TD9/93. This states that

The road alignment shall be designed so as to ensure that Standards of curvature, visibility, superelevation, etc. are provided for a Design Speed which shall be consistent with the anticipated vehicle speeds on the road. A relatively straight alignment in flat country will generate higher speeds, and thus produce a higher Design Speed than a more sinuous alignment perhaps located in hilly terrain, or amongst dense land use constraints. There is therefore always an inherent economic trade-off between the construction and environmental costs of alternative alignments of different Design Speeds, and their user benefits, which shall be tested by COBA.

The options that are considered in this report are broadly based on those that emerged from the Mott McDonald report dated December 2008 and reproduced in the Attleborough Transport Topic Paper (Draft) dated February 2012. Although in both documents all the options are shown diagrammatically they indicate flowing alignments, which are well suited to maximising their attractiveness to through traffic.

Building on this previous work, initial horizontal alignments have been produced, which indicate that all options between London Road and Buckenham Road/Attleborough Road (the B1077) have a theoretical Design Speed of 100A kph. Criteria taken into account include harmonic mean visibility, bendiness, likely access numbers and verge width.

However, horizontal alignment is not the only component of highway design with vertical alignment playing an equally important role. In the case of the area to the south of Attleborough, which is predominantly flat, the need for the Link Road to cross the railway is a considerable challenge and this is discussed further below in relation to connections with Hargham Road and Poplar Road.

Breckland Council has specific requirements as to the form that the Link road will take in order to provide for both development traffic and through traffic. This may well mean that although the Link Road will have a Design Speed of 100kph, it will have speed limits specific to its role, which may change over its length. This is discussed under each option description.

8. Constraints

A Constraints Plan has been produced (Drawing Number CS/060268-02), which gathers together all relevant information that may have a bearing on the location of Link Road options. This has been compiled from a number of sources including Breckland Council, Norfolk County Council, Statutory Undertakers, Google imagery, websites, and specific bodies of work carried out for this and other studies in the area. In addition to the Constraints Plan, there are a number of figures, which show additional information. Specialist reports carried out for this study, in which further information can be found, are included in the following Sections:

- Ecology Section 15.0
- Landscape Section 16.0
- Geotechnical (Preliminary Sources Desk Study)/Stats Appendix C

In relation to archaeology that in shown on the Constraints Plan, information has been obtained from a report prepared in 2009 by NAU Archaeology entitled An Archaeological Desk-Based Assessment of Land at Attleborough, Norfolk.

The information that the Constraints Plan contains may not necessarily constitute a constraint to Link Road options unless they are associated with policies that restrict development, one such example being Bunn's Bank Scheduled Monument on which no development will be permitted. In the main, the constraints will be used as part of a means of assessing the Link Road options with a view of determining the ones that are the best performing. Other factors will be part of this assessment, including traffic. The assessment of the Link Road options, are in Sections 11.0 (General Development Information), 12.0 (Option 2), 13.0 (Option 2), and 14.0 (Option 3). Comparisons of the three options are in Section 19.0 (Option Comparison).

9. Development Scenarios/Future Year Model

9.1 Introduction

The future year model networks have been developed from a copy of the base model with base model matrices updated to account of background growth and future year developments. The separate elements are detailed in the following section.

9.2 Future Years

The future years are agreed as follows;

- 2017 – End of Phase 1 (Masterplan)
- 2031 – All development (Masterplan) complete

9.3 Do-Minimum Network

The appropriate additions to the network have been made to include the separate elements of development within the town. This includes parts of the Link Road and minor road network which provide vehicles with the ability to access new areas of development. This is especially true south of the train lines where large residential developments will require significant access infrastructure.

The automation of the railway crossing on Station Road has also been incorporated within all future year models as this was completed in 2013. The rail timetables are unchanged as no new services are planned at the time of writing.

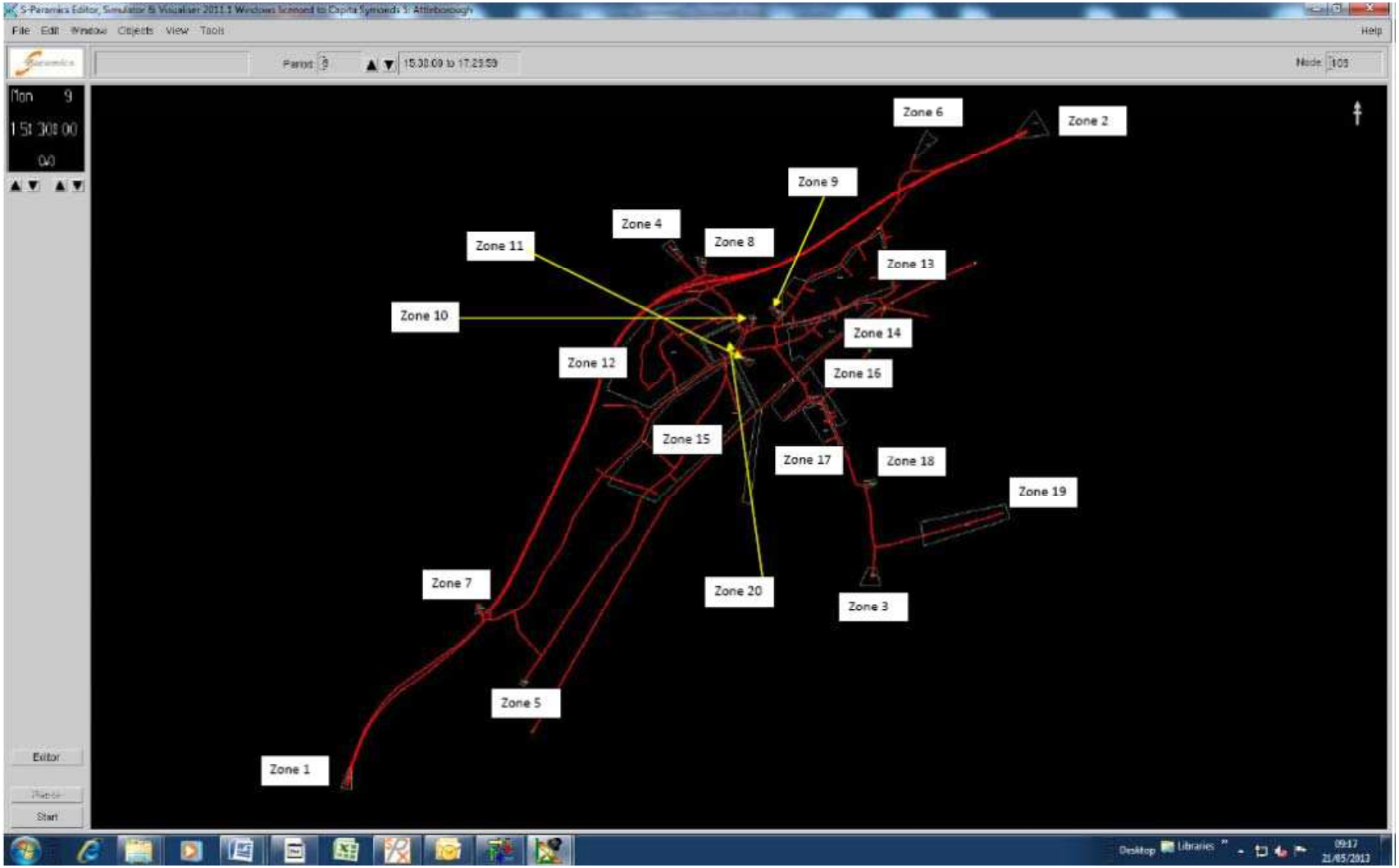
9.4 Zone Structure

Additional zones have been added to account for the separate phases of growth in Attleborough. The additional zones in the future year total split between areas north and south of the railway lines. Full details of the additional zones are provided in Table 9.1 and associated screenshots of the Paramics model.

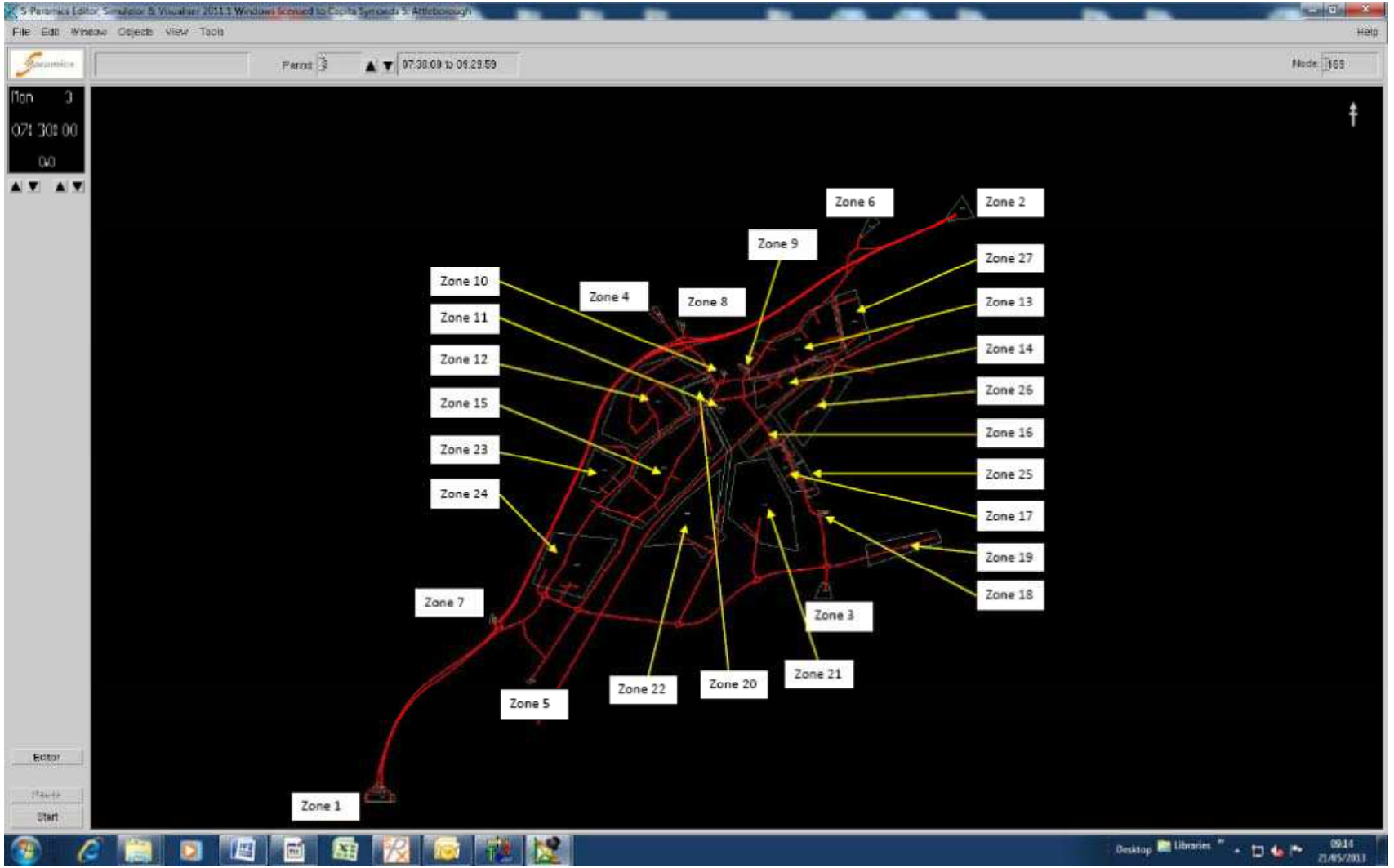
Zone	Description	Phasing	Opt 1	Opt 2
			Housing Units / Employment Land	
Zone 21	Residential dwellings South of Train Line and West of Buckenham Road	Phase 3	1,100	1,100
Zone 22	Residential dwellings South of Train Line and West of Buckenham Road	Phase 2	1,200	1,000
Zone 23	London Road Residential Dwellings	Phase 1	375	375
Zone 24	London Road Employment Area	Phase 1	325 10 HA	525 5 HA
Zone 25	EMPLOYMENT AREA South of Train Line and East of Buckenham Road	Phase 1	-	5HA
Zone 26	Residential dwellings South of Train Line and East of Buckenham Road	Phase 5	650	650
Zone 27	Mill Lane Residential Dwellings	Phase 4	350	350

Table 9.1: Proposed Future Year Model Zones

In addition to the inclusion of the additional zones shown in Table 9.1 an additional car park has been added to Zone 20. This has been used to represent the addition of a new supermarket to the south of the railway line as per the Scott Wilson Masterplan. By using car parks within Zone 20 in this way it is possible to replicate the affects of a possible transfer of trips from the existing to the new supermarket.



Screen Shot 1: Base Year Zone Layout



Screen Shot 2: Future Year Zone Layout

9.5 Background Traffic Growth

TEMPRO Growth factors adjusted for NTM growth will be applied to the base model following guidance provided in WebTAG Unit 3.15.2: The Use of Tempro, in order to generate the future year matrices.

Growth factors for the geographical areas of Norfolk, Breckland and Attleborough have been derived from the TEMPRO system for application to different parts of the base matrices to reflect external to external, internal to external and internal to internal variations.

In order to avoid the potential for double counting the initial growth factors have been derived using alternative planning assumptions which remove any growth in households and jobs within Attleborough (including appropriate adjustments to Breckland and Norfolk factors).

The different growth factors applied to the separate zone types are described below;

- **External to External (Link Road)** – Growth factors derived using Norfolk (rural: trunk) with adjusted planning assumptions;
- **External to External (Others) –** Growth factors derived using Breckland (all: all) with adjusted planning assumptions;
- **External to Internal –** Growth factors derived using Attleborough (all: all) with adjusted planning assumptions
- **Internal to External –** Growth factors derived using Attleborough (all: all) with adjusted planning assumptions
- **Internal to Internal –** Growth factors derived using Attleborough (all: all) with adjusted planning assumptions

9.6 Proposed Development Trip Demands

The additional trips to be generated by new development have been determined using the alternative planning assumptions function within TEMPRO using the following procedure:

Determine background traffic growth for 2017 and 2031 assuming no development in Attleborough;

Determine future year traffic growth for 2017 and 2031 using planning assumptions for Attleborough (see Table 9.4)

The derived factors have been applied to all cells within the base matrices with an internal zone as an origin or destination (or both). The resulting matrix totals have been subtracted from one another to identify the traffic growth associated with new development.

These trips have then be distributed across the new development zones applying distribution based on existing residential and employment zones. Adjustments have also been made to the external-external traffic growth factor calculations to remove the regional housing and employment allocations being delivered within Attleborough to prevent double counting.

9.6.1 *EMPLOYMENT LAND*

The location of employment land in Attleborough in future years have been identified. These are presented below in Table 9.2:

Use Class	Option 1 – All Employment in the London Road Area	Option 2 – 50% Employment in the London Road Area 50% South of Railway Line
Mix of Use Classes	B1 – 3ha B2 – 7ha	B1 – 3ha B2 – 7ha

Table 9.2: Location of Future Year Employment

A further 20 ha of employment land has also been identified at Snetterton Heath. The mix of employment is detailed in Table 9.3 below;

Use Class	Snetterton Heath (6 – 7ha identified to the north of the A11 and the remainder to the south of the A11)
Mix of Use Classes	B1 – 3ha B2 – 7ha B8 – 10ha

Table 9.3: Employment Mix at Snetterton Heath

9.6.2 *HOUSING*

The Planning Application from Taylor Wimpey for the erection of 375 dwellings at land on London Road has been approved and the Phase 1 Masterplan assumptions have been therefore amended accordingly. For the purposes of determining development related traffic the figures shown in Table 9.4 below have been adopted.

Future Year	2017	2031
Jobs	777	2951
Households	600	4000

Table 9.4: Adopted Development Assumptions

9.6.3 *SUPERMARKET*

A supermarket store is forecast to be delivered as part of the Phase 2/3 proposals. It has been assumed as part of the modelling exercise a similar sized supermarket to the existing Sainsbury's store will be constructed in Phase 2. Therefore the supermarket will be accounted for in the 2031 traffic model.

9.6.4 *OTHER AMENITIES*

Other amenities required to service dwellings will be delivered throughout the various phases of development including schools, local centres, library etc. The modelling has assumed individual amenities in accordance with the Scott Wilson Master Plan[1].

9.6.5 *PHASING OF DEVELOPMENT*

The phasing of future year developments has been incorporated within the future year models in accordance with delivery plan in the Scott Wilson Master Plan[2]. Therefore the 2017 models include Phase 1 proposals and 2031 models including all development.

The demand from employment land has been profiled evenly each year over the period of 2013 -2031, therefore fours years worth of employment growth will be accounted for within the 2017 model and the remainder in the 2031 model.

[1] Scott Wilson – Attleborough Strategic Masterplan – Final Masterplan Report – Page 21
[2] Scott Wilson – Attleborough Strategic Masterplan – Final Masterplan Report – Page 47

9.6.6 *DEVELOPMENT SCENARIOS*

The two development scenarios that have been assessed are SC1 and SC2. Within these, employment has been as taken as below:

- SC1 All employment to the north of London Road;
- SC2 Employment split 50/50 between north of London Road and to the south of the railway.

10. Future Traffic Flows

Traffic flows in the future year scenarios of 2017 and 2031 and based on the above scenarios are shown in Tables 10.1 and 10.2 respectively, below.

In the table, SC1 and SC2 are associated with the following improvement scenarios:

1. Do Minimum (no Link Road or Town Centre improvements)
2. Attleborough with Town Centre improvements, no Link Road
3. Attleborough with Town Centre improvements and inner Link Road
4. Attleborough with Town Centre improvements and external Link Road

The inner Link Road location refers to Options 1 and 2 in Sections 12.0 and 13.0, and the external Link Road location refers to Option 3 in Section 14.0.

Tables 10.1 and 10.2 give the two-way flows that will be using various sections of the Link Road in both future year scenarios (2017 and 2031 respectively). Flows are shown in Peak Hour (AM and PM), and AADT flows. AADT flows have been derived from conversion factors based on Highways Agency traffic counts in March 2012 (combined AM and PM peak hour flows X 5.016). Heavy Goods Vehicle content is shown in brackets (AM and PM only).

Employment Scenario	Improvement Scenario		Link Road
SC1	1. Do Minimum (no Link Road or Town Centre improvements)	AADT	-
		AM	-
		PM	-
	2. Attleborough with Town Centre improvements, no Link Road	AADT	-
		AM	-
		PM	-
	3. Attleborough with Town Centre improvements and inner Link Road	AADT	1284
		AM	150 (14)
		PM	106 (10)
	4. Attleborough with Town Centre improvements and external Link Road	AADT	1299
		AM	143 (15)
		PM	116 (9)
SC2	1. Do Minimum (no Link Road or Town Centre improvements)	AADT	-
		AM	-
		PM	-
	2. Attleborough with Town Centre improvements, no Link Road	AADT	-
		AM	-
		PM	-
	3. Attleborough with Town Centre improvements and inner Link Road	AADT	1239
		AM	146 (16)
		PM	101 (11)
	4. Attleborough with Town Centre improvements and external Link Road	AADT	1274
		AM	141 (17)
		PM	113 (11)

Table 10.1: Future Traffic Flows associated with Attleborough Link Road - 2017

Employment Scenario	Improvement Scenario		Link Road
SC1	1. Do Minimum (no Link Road or Town Centre improvements)	AADT	-
		AM	-
		PM	-
	2. Attleborough with Town Centre improvements, no Link Road	AADT	-
		AM	-
		PM	-
	3. Attleborough with Town Centre improvements and inner Link Road	AADT	5583
		AM	765 (29)
		PM	348 (9)
	4. Attleborough with Town Centre improvements and external Link Road	AADT	14867
		AM	1174 (28)
		PM	1790 (24)
SC2	1. Do Minimum (no Link Road or Town Centre improvements)	AADT	-
		AM	-
		PM	-
	2. Attleborough with Town Centre improvements, no Link Road	AADT	-
		AM	-
		PM	-
	3. Attleborough with Town Centre improvements and inner Link Road	AADT	7298
		AM	659 (43)
		PM	796 (27)
	4. Attleborough with Town Centre improvements and external Link Road	AADT	12279
		AM	1115 (44)
		PM	1333 (30)

Table 10.2: Future Traffic Flows associated with Attleborough Link Road - 2031

From Table 10.1 it can be seen that as a result of the first phase of the development (600 houses in 2017), traffic flows on the Link Road (any location) will be no greater than 1300 vehicles AADT of which it is likely that not more than 10% will be through traffic. This is with Town Centre improvements and either of the two employment scenarios. Flows such as this are very low and it could be difficult to justify a complete Link Road in the early years of the development.

By 2031, when it is assumed that the whole development will have been completed and occupied (4000 houses), flows on the Link Road will have risen to 7300 vehicles AADT on an internal Link Road and 14900 vehicles AADT on an external Link Road. This is in the employment scenario with all development to the north of London Road (SC1). Even scenario SC2 with a 50/50 split of employment to the north and south of the railway will have AADT flows of over 12200 vehicles. The majority of this traffic will be development based.

It is due to the low flows on the Link Road options, particularly in the early years of the development, that a new road could be provided incrementally based on the progress of the development. However, this will mean that any complete road from London Road to the B1077 that could give relief to Attleborough Town Centre from east/west (and vice versa) traffic will not be in place until the development has progressed to a point that traffic flows have increased to justify this. Although phasing the Link Road may not be considered appropriate, what follows below is a discussion on how phasing could happen.

The initial 600 houses will require a road in order to provide access for construction purposes and to allow access to the local highway network by occupiers. Development could commence at either the western or eastern ends of the identified area and the following outlines the benefits and disbenefits of both.

10.1 Initial Development in the Western Part of the Identified Area

It has been assumed that the majority of development will lie to the east of the railway line. The main *benefit* of the initial phase starting in this area is that it will be well placed in relation to the local highway network as well as the Trunk Road network (the A11), which will allow easy access in both the Cambridge and Norwich directions. In addition, the majority of non-Trunk Road trips will be related to Attleborough town centre and as a result there will be few that will be through movements.

The main *disbenefit* to the initial phase commencing towards the western part of the identified area is that the part of the Link Road that will be required to access it will have to include a new bridge over the railway and the cost that will be necessary. However, this will mean that a major part of the eventual Link Road will have been provided early on. In addition to this, the initial section of new road will not function as a complete link between London Road and the B1077 and therefore east/ west traffic and HGVs originating from Bunn's Bank and Gaymer's Industrial Estates will continue to have to use roads within Attleborough Town Centre to access the Trunk Road network. This will continue until the full Link Road is completed.

10.2 Initial Development in the Eastern Part of the Identified Area

Commencing development in the eastern part of the identified area will have the *benefit* that the part of the Link Road that will be required will be relatively easy and relatively inexpensive to construct.

The main *disbenefit* is that it will give access to a part of the local highway network (the B1077) that is remote from the A11 Trunk Road. This will mean that all traffic destined for Cambridge and Norwich will have no option but to pass through the eastern part of Attleborough Town Centre in order for it to reach the A11 at the grade-separated junctions at the north end of the town or at Besthorpe. This will inevitably increase traffic in the parts of the town through which roads to these junctions pass. The B1077 to the south of Attleborough does not give convenient access to the wider highway network. The disbenefits to HGVs and other local east west traffic without a full Link Road are as initial development concentrated to the west, above.

The Link Road options that have been developed in this report assume that a full link between London Road and the B1077 will ultimately be provided and appropriate locations are explored for it. Although this will give the greatest flexibility, which can accommodate both development and through traffic, each option description includes how it could be constructed in sections to tie in with the phasing of development.

With regard to the timing of any phasing of the Link Road to mirror the progress of the proposed development, the following is suggested.

Traffic modelling has been undertaken for development scenarios in 2017 and 2031, with completion of the Link Road by the latter. The date at which the Link Road will be provided in its entirety will depend upon the speed at which the development is progressed. As outlined above, in highways terms, an initial development to the west which would enable development traffic to access the A11 via London Road without having to travel through the town centre would be preferred. It is envisaged that completion of the Link Road would be conditioned as part of the Planning Permission for the development, linked to construction/occupation of a percentage of dwellings. This percentage will relate to congestion on the highway network and standards based on the number of properties to be accessed via a single point on it. Permissible development size prior to constructing the completed Link Road can be assessed by the existing Paramics model via varying the development/growth profiles and associated highway network.

10.3 Alternative Link Road Proposals

All three proposed route options tie into the existing highway network on the B1077 and London Road at locations previously proposed, with the exception of Option 2 at London Road (Drawing CS/060288/SK02). With the additional traffic survey work undertaken and the use of trip generation, distribution and reassignment, combined with identification of existing constraints, the previous option work undertaken by others has been developed and refined.

10.4 Breckland Lodge Roundabout

Breckland Lodge Roundabout has been assessed in terms of the future traffic flows associated with the development, as discussed in 10.1 above. The proposed roundabout layout is as indicated on Figure 10/1, which is Bidwell's Building Consultancy Drawing Number SS39600002/002.

The roundabout has been analysed using Transport Research Laboratory (TRL) programme Arcady version 6, utilising the following development scenarios SC1 and SC2, and two link road options. These are also shown in Tables 10/1 and 10/2:

- **SC1 – 3** Employment: All north of London Road and Attleborough with Town Centre Improvements and Internal Link Road.
- **SC1 – 4** Employment: All north of London Road and Attleborough with Town Centre Improvements and External Link Road.
- **SC2 – 3** Employment: Split 50/50 between London Road and South of train lines and Attleborough with Town Centre Improvements and Internal Link Road.

- SC2 – 4 Employment: Split 50/50 between London Road and south of train lines and Attleborough with Town Centre Improvements and External Link Road.

The traffic flows used in the Arcady analysis were generated from the Paramics model and are contained in Appendix B1. The Arcady results are also contained in Appendix B1 and summarised in the following tables:

2031 AM	SC1-3		SC1-4		SC2-3		SC2-4	
	Queue	RFC	Queue	RFC	Queue	RFC	Queue	RFC
London Road	1.0	0.516	1.3	0.564	0.8	0.461	1.1	0.519
A11 NB	4.8	0.831	4.8	0.833	4.6	0.825	4.8	0.831
Wroo Road	0.3	0.250	0.3	0.256	0.3	0.245	0.3	0.252
A11 SB	4.5	0.823	4.2	0.812	3.9	0.800	4.0	0.802

Table 10.3: Summarised 2031 AM Arcady Results for Breckland Lodge Roundabout

2031 PM	SC1-3		SC1-4		SC2-3		SC2-4	
	Queue	RFC	Queue	RFC	Queue	RFC	Queue	RFC
London Road	0.1	0.120	0.3	0.217	0.4	0.297	0.3	0.217
A11 NB	2.5	0.720	15.4	0.950	18.7	0.962	20.6	0.968
Wroo Road	0.1	0.095	0.2	0.193	0.3	0.211	0.3	0.203
A11 SB	0.8	0.445	0.6	0.373	1.3	0.571	1.2	0.537

Table 10.4: Summarised 2031 PM Arcady Results for Breckland Lodge Roundabout

Queue = number of vehicles queuing

RFC = Ratio of flow to capacity. RFC of 0.85 or lower is generally accepted as being within capacity.

The Arcady model of the design shown in Bidwell's Building Consultancy Drawing Number SS39600002/002 assumes equal use of the entry width on all lanes of the approach arms to the roundabout. However, unequal lane usage is expected to occur on both A11 approaches to the roundabout due to the unbalanced turning movements. Therefore, unequal lane usage has been tested for the scenarios where it is greatest, and an estimate of the predicted length of queues due to the unequal lane usage assessed.

For the A11 Northbound approach, the worst time period of unequal lane usage will occur during the SC1 - 3 AM period, resulting in a predicted queue of 16.4 vehicles over two lanes (equating to approximately 50 metres per lane) and an RFC of 0.959.

For the A11 Southbound approach, the worst time period of unequal lane usage will occur during the SC2 - 3 AM period, resulting in a predicted queue of 39.7 vehicles over two lanes (equating to approximately 120 metres per lane) and an RFC of 1.016.

Therefore, the A11 approaches are predicted to be at capacity in 2031, although improvements to the segregated left turn lane design (as per section 10.3.1) should reduce congestion on the London Road arm.

10.4.1 Segregated Left Turn Lane from London Road to A11

The proposed segregated Left Turn Lane from London Road to A11 as indicated on Bidwell's Building Consultancy drawing SS39600002/002 does not meet the necessary design standards.

Paragraph 2.8 of TD51/03, 'Segregated Left Turn Lanes and Subsidiary Deflection Islands at Roundabouts' from Volume 6 of the Design Manual for Roads and Bridges (DMRB) states inclusion of a segregated left turn lane should be considered if:

The flow of left turning vehicles (L) is greater than or equal to the total entry arm inflow in vehicles per hour (F) divided by the number of proposed entry lanes onto the roundabout including the segregated left turn lane (E).

	Left turning vehs (L)	Total entry flow (F)	Entry lanes (E)	F/E	L greater than F/E
SC1-3 AM	805	845	2	422.5	Yes
SC1-4 AM	960	1009	2	504.5	Yes
SC2-3 AM	798	834	2	417	Yes
SC2-4 AM	941	987	2	493.5	Yes
SC1-3 PM	287	326	2	163	Yes
SC1-4 PM	562	671	2	335.5	Yes
SC2-3 PM	532	589	2	294.5	Yes
SC2-4 PM	531	589	2	294.5	Yes

Table 10.5: Assessment to determine if Left Turn Segregated Lane from London Road to A11 should be considered

Therefore, a left turn lane should be provided.

The exit merge proposals are missing from the design drawing. Paragraph 2.45 of TD51/03 of DMRB indicates 3 basic types of exit layout from the segregated left turn lane, indicated on Figures 2/6, 2/7 and 2/8 of TD51/03 and these should be reviewed as part of the design process.

Based on the current design it should be noted that the results of the Paramics model identifies that not all the left turning traffic from London Road to the A11 uses the segregated left turn lane, due to congestion where the left turn segregated lane joins the A11. These traffic flows are summarised in the following table:

	2031 AM				2031 PM			
	SC1-3	SC1-4	SC2-3	SC2-4	SC1-3	SC1-4	SC2-3	SC2-4
Segregated Left turn lane	651	784	652	769	241	497	400	442
Left turn at roundabout	154	176	146	172	46	65	132	89

Table 10.6: Usage of Segregated Left Turn Lane on London Road

A revised design of the segregated Left Turn Lane from London Road to the A11, which complies to DMRB standards, should remove the predicted congestion and enable all left turning vehicles to utilise the segregated left lane.

10.5 Roundabout at Western End (London Road) of Link Road

The roundabout at the western end of the Link Road options has been analysed in this section. For reference, SC1 – 3 and SC2 – 3 are based on an internal Link Road location (Options 1 and 2) and SC1 – 4 and SC2 – 4 are based on an External Link Road Location (Option 3).

The proposed roundabout is shown on Drawing Numbers CS/060268/SK01, SK02, and SK03 (the three Link Road options).In each case, the inscribed circle diameter (ICD) is 55 metres.

The roundabout has been analysed using Transport Research Laboratory (TRL) programme Arcady version 6. The Arcady results are contained in Appendix B2 and the results are summarised in the following tables:

2031 AM	SC1-3		SC1-4		SC2-3		SC2-4	
	Queue	RFC	Queue	RFC	Queue	RFC	Queue	RFC
London Road NB	0.5	0.314	0.5	0.331	0.4	0.276	0.5	0.327
New Development	0.1	0.083	0.1	0.082	0.1	0.056	0.1	0.067
London Road SB	0.4	0.282	0.5	0.343	0.4	0.276	0.5	0.321
Link Road	0.6	0.394	1.0	0.510	0.5	0.350	0.9	0.482

Table 10.7: Summarised 2031 AM Arcady Results for London Road/New Development/Link Road Roundabout

2031 PM	SC1-3		SC1-4		SC2-3		SC2-4	
	Queue	RFC	Queue	RFC	Queue	RFC	Queue	RFC
London Road NB	0.9	0.473	1.4	0.589	0.8	0.448	1.1	0.524
New Development	0.1	0.082	0.1	0.131	0.1	0.085	0.1	0.095
London Road SB	0.2	0.137	0.3	0.239	0.2	0.193	0.4	0.277
Link Road	0.2	0.139	0.7	0.418	0.3	0.253	0.4	0.298

Table 10.8: Summarised 2031 PM Arcady Results for London Road/New Development/Link Road Roundabout

The Arcady results indicate the western roundabouts shown on Drawing Numbers CS/060268/SK01, SK02, and SK03 have adequate capacity in 2031 during all traffic flow scenarios.

Unequal lane usage is expected to occur on London Road northbound and the Link Road approaches to the roundabout due to the unbalanced turning movements. Therefore, unequal lane usage has been tested for the scenarios where it is greatest and an estimate of the predicted length of queues due to the unequal lane usage assessed.

For the London Road northbound approach, the worst time period of unequal lane usage will occur during the SC2 - 4 PM period with a predicted queue of 2.1 (equating to approximately 18 metres) vehicles and an RFC of 0.687.

For the Link Road approach, the worst time period of unequal lane usage will occur during the SC1 - 4 AM period with a predicted queue of 4.1 vehicles (equating to approximately 24 metres) and an RFC of 0.815.

10.6 Roundabout at Eastern End (B1077) of Link Road

The roundabout at the eastern end of the Link Road options has been analysed in this section. For reference, SC1 – 3 and SC2 – 3 are based on an internal Link Road location (Options 1 and 2) and SC1 – 4 and SC2 – 4 are based on an External Link Road Location (Option 3).

The proposed roundabout is shown on Drawing Numbers CS/060268/SK01, SK02, and SK03 (the three Link Road options). It should be noted that with Option 3, the Link Road ties into Bunn's Bank Road (SK03).All three options have roundabouts with ICDs of 55 metres.

The roundabout has been analysed using Transport Research Laboratory (TRL) programme Arcady version 6. The Arcady results are contained in Appendix B3 and the results are summarised in the tables below.

2031 AM	SC1-3		SC1-4		SC2-3		SC2-4	
	Queue	RFC	Queue	RFC	Queue	RFC	Queue	RFC
Link Road	0.3	0.207	0.6	0.361	0.3	0.218	0.6	0.390
Buckenham Road SB	0.4	0.306	0.7	0.396	0.5	0.340	0.8	0.434
Bunn's Bank Road	0.1	0.108	0.1	0.119	0.1	0.110	0.1	0.117
Buckenham Road NB	0.3	0.229	0.3	0.207	0.3	0.225	0.3	0.212

Table 10.9: Summarised 2031 AM Arcady Results for Link Road/Buckenham Road (B1077)/Bunn's Bank Road Roundabout

2031 PM	SC1-3		SC1-4		SC2-3		SC2-4	
	Queue	RFC	Queue	RFC	Queue	RFC	Queue	RFC
Link Road	0.1	0.092	0.3	0.249	0.3	0.250	0.4	0.270
Buckenham Road SB	0.3	0.214	0.8	0.441	0.8	0.437	1.0	0.513
Bunn's Bank Road	0.1	0.098	0.1	0.125	0.1	0.119	0.1	0.124
Buckenham Road NB	0.1	0.085	0.5	0.323	0.2	0.176	0.5	0.336

Table 10.10: Summarised 2031 PM Arcady Results for Link Road/Buckenham Road (B1077)/Bunn's Bank Road Roundabout

The Arcady results indicate the eastern roundabout shown on Drawing Number CS/060268/SK03 has adequate capacity in 2031 during all traffic flow scenarios.

For Link Road Options 1 and 2, the alignment ties into the B1077 Buckenham Road to the north of Bunn's Bank Road. Capacity analysis has been undertaken on a three arm roundabout shown on Drawing Numbers CS/060268/SK02 and SK03.

The roundabout has been analysed using Transport Research Laboratory (TRL) programme Arcady version 6. The Arcady results are contained in Appendix B3 and the results are summarised in the tables below.

2031 AM	SC1-3		SC1-4		SC2-3		SC2-4	
	Queue	RFC	Queue	RFC	Queue	RFC	Queue	RFC
Link Road	0.2	0.196	0.6	0.358	0.3	0.216	0.6	0.386
Buckenham Road SB	0.3	0.248	0.5	0.333	0.4	0.285	0.6	0.370
Buckenham Road NB	0.2	0.161	0.3	0.210	0.3	0.222	0.3	0.209

Table 10.11: Summarised 2031 AM Arcady Results for Link Road/Buckenham Road (B1077) Roundabout

2031 PM	SC1-3		SC1-4		SC2-3		SC2-4	
	Queue	RFC	Queue	RFC	Queue	RFC	Queue	RFC
Link Road	0.1	0.091	0.3	0.246	0.3	0.247	0.4	0.267
Buckenham Road SB	0.2	0.156	0.6	0.377	0.6	0.382	0.8	0.449
Buckenham Road NB	0.1	0.083	0.5	0.319	0.2	0.173	0.5	0.331

Table 10.12: Summarised 2031 PM Arcady Results for Link Road/Buckenham Road (B1077) Roundabout

The Arcady results indicate the roundabout has adequate capacity in 2031 during all traffic flow scenarios.

11. The Development of Link Road Options

11.1 General

All the Link Road options that have been considered in this report are loosely based on those that emerged from the 2008 Mott McDonald report and subsequently included in the Attleborough Transport Topic Paper (Draft) 2012. Particular elements of the Link Road that have received consideration are as follows:

- Junction points on London Road;
- Crossing points of the railway;
- Junction points on the B1077;
- Connections with Hargham Road;
- Connections with Poplar Road and Leys Lane;
- Further information on phasing to tie in with development

All of the above elements have been considered with due regard to the constraints as shown on Drawing Number CS/060628-02

11.2 Junction Points on London Road

There has been no indication from Breckland Council that the Link Road will require a direct connection with the A11 at Breckland Lodge. As a result, connection points have focused on London Road. Although London Road has some development associated with it, there are lengths where a Link Road can commence without having a direct impact on this.

The closest that a commencement point can be located to Attleborough is immediately to the south of the General Employment Area (Victory Park), which has recently been provided with an access road from London Road. This location is the most northerly and has been called **LR (N)**.

The furthest south is immediately to the north of Peter Beales Roses Nursery/Sweet Briar Garden Centre. This location has been referenced as **LR (S)**.

Between these two locations (approximately 700 metres), a central location has been selected. This is closer to LR(N) than LR(S) in order that Link Road options will minimise impact on flood zones as shown on the Constraints Plan. This location has been referenced **LR (C)**.

Each of the connection points allows for access to proposed development to the west.

11.3 Crossing Points of the Railway

Appropriate crossing points of the railway have been briefly discussed under Design Speed above. They are closely related to the commencement points of the Link Road on London Road due to the relative distance between them (approximately 600 metres). It is considered that a perpendicular crossing of the railway is preferable to one on a skew as its design will be more straightforward and will be less expensive to construct. In reality, constraints have in some cases dictated this.

Although the large majority of existing railway crossing points in the area are level crossings (either signal and barrier controlled, or just gated), this is not considered appropriate for a Link Road that will be acting as an access road to a large development as well as a means of reducing traffic flows in the centre of Attleborough. Although an at-grade crossing will be more straightforward to design vertically than one requiring a bridge over the railway, there will be safety issues as well as limiting the attractiveness of the Link Road to diversionary traffic. Network Rail has a policy for managing level crossing safety, which is mainly based on existing facilities. However, in relation to new crossings, the policy states the following:

Only in exceptional circumstances shall we permit new crossings to be introduced onto the network.

As a result of the above all the crossing points of the railway that are discussed below are on bridges. Network Rail guidance (Network Rail Track Design Handbook NR/L2/TRK/2049) is that the desirable distance between track and bridge soffit should be a minimum of 5.1 metres and this allows for future electrification of the line. This vertical distance is what all of the railway crossings are based on.

Further information on the railway crossing points are discussed under the various Link Road options that have been considered.

11.4 Crossing Points of the B1077

Previous work carried out by Mott McDonalds in 2008 considered link road options between London Road and the B1077 and all the way through to the A11 junction to the north at Besthorpe. This study just considers the former. The ability of a junction on the B1077 to give the opportunity in the future to continue a link road all the way to the A11 will be assessed as part of each Link Road option.

The closest location to Attleborough for a B1077 junction is between the most southerly house on the west side of Buckenham Road (The Nook) and the most northerly house at Foundry Corner (The Foundry). This is a distance of approximately 230 metres. Within this distance, there are a number of options to link to the B1077 road with one closer to Foundry Corner having the ability to remove the double bend by realigning Buckenham Road to the west of the houses. A junction option in this general area has been called **BR (N)**.

Between Foundry Corner and Puddledock, Bunn's Bank Road gives access to Bunn's Bank Industrial Estate, which includes a nursery and poultry companies, all to the east of the B1077. The Bunn's Bank Road junction is where Buckenham Road becomes Attleborough Road. An eastern junction of the Link Road with the B1077 at this location will benefit access to Bunn's Bank Industrial Estate. A junction option at Bunn's Bank Road junction has been referenced **BR (S)**.

There is a short distance (65 metres) within which a central junction on the B1077 can be positioned that will allow the possible extension of the Link Road towards Besthorpe. This is between the most southerly house (Bethany) at Foundry Corner and the northern edge of the nursery on Bunn's Bank Road. Close to its boundary is a water station. A junction option at this location on the B1077 has been referenced BR (C).

11.5 Connections with Hargham Road

Before the physical attributes concerning a connection of Hargham Road with the Link Road are considered further, it is necessary to determine whether or not one is actually required and the function that it will perform.

In its existing form, Hargham Road is a very minor highway and does not directly link any communities to Attleborough. Its function is more of a means of access to and from the town centre for those residents that live adjacent to it. With more properties adjacent to Hargham Road the closer it gets to the town centre, including those in Poplar Road, the higher the traffic flows although in reality these are still low. The residents of these properties have a means of access to London Road to the west via either New Road to the north, or a minor unnamed road through to Breckland Lodge to the south, the latter of which is close to the A11 Trunk Road.

Proposals concentrate development to the south east of the railway and this is shown on Figure 1. It appears that little, if any, will be provided between the railway and London Road, through which Hargham Road passes and therefore a connection for this will not be required. However, the residents of Hargham Road to the south will still require a means of access to Attleborough town centre and a connection with the Link Road from the south will provide this for some options. It is considered that this traffic should use the western end of the Link Road and London Road rather than Hargham Road itself to reach the town centre. Link Road options further south are less likely to require such a connection due to there being far fewer properties.

It is due to the undesirability of development traffic using Hargham Road to access Attleborough town centre that an all-movement junction such as a crossroads or roundabout is not recommended. Combined with a link from the south, as outlined above, a bus-only link could be introduced onto the Link Road from the north. This could be part of a bus route through the development. This is discussed further under each Link Road option, as well as under sub section 18.4 Public Transport (bus).

11.6 Connections with Poplar Road and Leys Lane

Both Poplar Road and Leys Lane lie within the area to the south of Attleborough where development is proposed to be concentrated.

At its closest, Poplar Road lies approximately 75 metres east of the railway. It will only be affected by Link Road options that cross the railway between the northern and southern sections of Fowler's Lane that connect to it. In these cases there will be a need for a bridge to span the railway and the distance between the two is not sufficient for the Link Road to reach the level of Poplar Road. As a result, it will not be possible to connect Poplar Road with the Link Road and it will either have to pass beneath it in an underpass, or be stopped up on its north and south sides. Even if a vehicular underpass is not provided, a facility that is suitable for pedestrians and cyclists will allow its continuation as a Public Right of Way. The issue of Poplar Road in relation to the Link Road is discussed in more detail under the one Link Road option that affects it.

Leys Lane performs a similar function to Hargham Road although there are fewer properties adjacent to it. As it links into the south of Attleborough it is well positioned in relation to the proposed development and as a result its connection to the Link Road is likely to be necessary to the north and south for options that pass through its centre. For options further south, a northern link only will be appropriate. Depending upon its function in relation to the development, it is likely that Leys Lane will require some upgrading. Due to its location at least 700 metres east of the railway and the flatness of the topography in this area, its connection with the Link Road will be physically possible. This is discussed in more detail under the various Link Road options.

11.7 Link Road Characteristics

It has been requested that consideration be given to introducing a *street-like* road environment to the eastern section of the Link Road and a more *link road-like* road environment to the west. Before options can be measured against objectives, it is necessary to define what can be considered *street-like* and *link road-like* environments and assess the suitability of these within the development.

11.7.1 Street-Like Road Environment

- Having active frontage directly onto the street;
- Being a place in its own right fulfilling more than simple move of traffic functions;
- A high percentage of non motorised and public transport movement with limited larger vehicles present;
- Providing pedestrians with opportunities to informally cross or gap seek safely, and crossings are not grade separated;
- Incorporating junctions that have relatively tight radii and crossroads are present not roundabouts;
- Minimisation of traditional highway engineering paraphernalia;
- Average vehicle speeds of less than 20mph or in new streets there is a Design Speed of 20mph; and
- Narrower carriageway widths often with some element of on-street parking.

The document *Manual for Streets (CIHT)* states the following:

- *Streets have a community function as spaces for social interaction;*
- *Streets have a minimum of highway design features necessary to make them work properly.*

A clear distinction can be drawn between streets and roads. Roads are essentially highways whose main function is accommodating the movement of motor traffic. Streets are typically lined with buildings and public spaces, and while movement is still a key function, there are several others, of which the place function is the most important.

Streets have five principal functions:

- *Place: a sense of place which means that local distinctiveness, visual quality; and propensity to encourage social activity;*
- *Movement: movement should not be considered in independently of the street's other functions;*
- *Access: providing frontages that are directly accessible on foot and that are overlooked from the street is highly desirable in most circumstances as this helps to ensure that streets are lively and active places;*
- *Parking: a well-designed arrangement of on-street parking provides convenient access to frontages and can add to the vitality of a street. Conversely, poorly designed parking can create safety problems and reduce the visual quality of a street; and*
- *Drainage, utilities and street lighting.*

Streets should no longer be designed by assuming 'place' to be automatically subservient to 'movement'. Both should be considered in combination, with their relative importance depending on the street's function within a network.

11.7.2 LINK ROAD-LIKE ROAD ENVIRONMENT

- Speed limits of 40mph or greater;
- Standard width carriageways;
- Grade-separated pedestrian crossing locations (underpasses and footbridges);
- Roundabout junctions; and
- Usable by all vehicle classes, including HGVs.

It is considered that a single Link Road that is composed of *street-like* and *link road-like* characteristics over different parts of its length is unlikely to be entirely appropriate for the traffic composition that will be using it. The Link Road will be carrying traffic generated by the development and which may be using just a part of it, or crossing it to access different areas including Attleborough town centre.

At the same time the road will also be carrying diversionary traffic between London Road and the B1077 (and vice versa) that will be avoiding Attleborough town centre. This will include Heavy Goods Vehicles either destined or originating from Bunn's Bank or Gaymers Industrial Estates, or those for which the Link Road will be part of longer distance journeys. Whilst the varying standard of the Link Road could be appropriate for the development traffic, this will be less so for the diversionary traffic and HGVs on the section that will be have *street-like* characteristics and contain elements of a standard more suited to lower vehicle speeds and lower traffic flows as described in 11.7.1.

The traffic that will be using the Link Road has been determined in Section 10.0 and has been based on development scenarios discussed in Section 9.0. The impact of flows on the options considered is discussed in their descriptions below.

11.8 Specific Link Road Options

Earlier in this section, it was determined that there are 3 possible junction points on London Road and 3 on the B1077. This gives, in theory, a total of 9 possible Link Road options. As stated above, it is unlikely that any option on its own will be able to achieve all the requirements for a Link Road, especially in relation to providing different road characteristics on different sections. As a result of this, 3 distinctly different options have been considered further, each of which will be ultimately assessed against the objectives that are listed in Section 5.0 as well as other relevant criteria. Although this is covered within each option description, the main option comparison work is contained in Section 19.0.

To recap, the objectives are:

- To cater for traffic generated by the proposed development to the south of Attleborough;
- To reduce traffic impact in Attleborough town centre;
- To act as a diversionary route for traffic between London Road and the B1077 (and vice versa);
- To provide a more appropriate means of access to and from Bunn's Bank and Gaymers Industrial Estates in relation to the wider highway network;
- To function as an integrated public transport route; and
- To provide *street-like* road characteristics to the east and *link road-link* road characteristics to the west.

The options are as follows (references are to their western and eastern connection points as described in sub sections 11.2 and 11.4 respectively).

- **Option 1: London Road (north) to Buckenham Road (north)**-Drg. No. CS/060268/SK01
- **Option 2: London Road (central) to Buckenham Road (centre)**-Drg. No. CS/060268/SK02
- **Option 3: London Road (south) to Buckenham Road (south)** -Drg. No. CS/060268/SK03

Clearly, there are other combinations of western and eastern connection points but those below represent a broad selection covering the whole of the proposed development area. There are currently no detailed development plans and these will be formulated following the selection of a preferred Link Road option. All options have taken into consideration constraints as shown on the Constraints Plan, Drawing No. CS/060268-02, which contains many of the existing features and other relevant information discussed in earlier sections of this report.

Each option has been designed using appropriate computer software and has been based on supplied Ordnance Survey and Lidar (**Li**ght **D**etection **a**nd **R**anging) data.

The description of each option primarily relates provision in its entirety. As Section 10.0 describes traffic flows in 2017 and 2031, each option description includes suggestions as to where they could be split to allow a phased approach.

11.9 Option Costs (General)

As this report is concerned with Concept Design Options rather than those that have had the benefit of preliminary design, all the cost estimates that have been produced have been based on Laxton's Methodology and are based on 2013 prices. What follows is the methodology and its application for schemes in south east Wales.

11.9.1 Laxton's Methodology

The process is broken down into the following basic sections:

- Calculate the total surface area of the road
- Apply the **current** carriageway construction basic rates to calculate the Pavement Cost
- Use the Pavement Cost and Contract Breakdown to calculate the Contract Value
- Apply earthworks adjustment factor (if any) to calculate revised contract value
- Use the revised Contract Value and Contract Breakdown to calculate the cost of other elements
- Calculate the Estimate Value (excluding Preliminaries)

Other factors may need to be taken into consideration:

Example:

Pavement cost = rate x area = a

Pavement cost is 25% of the contract value so….

Contract Value = (a x 4)

Earthworks = (a x 4) x 23%

+ adjustment (depends on rural, urban, hilly, waterlogged etc)

Various adjustments dependent upon site location taken as a % of the total length of the route (see table below for explanation)

Drainage = (a x 4) x 12%

Structures calculated separately by structures team

Others (e.g. stats) = (a x 4) x 10%

Assumed Prelims = 21% of total (based on past experience)

If earthwork adjustment included, then contract value readjusted:

Revised Contract value = $\frac{\text{total (earthworks + adjust) + pavement}}{48\%} = y$

Therefore:

Drainage = 12% x y

Others = 10% x y

	Description	Factor
Earthworks adjustment to affected areas	Terrain adjustment for rural undulating area:	20%
	Terrain adjustment for waterlogged ground:	250%
	Material adjustment for high excavation / reuse:	20%
	Material adjustment for high disposal / fill:	100%

Table 11.1 Breakdown of Components:

Others – includes for stats, traffic signs & road markings, lighting, communications, kerbs and footways

Prelims – includes for accommodation and utilities/rates etc, vehicles, traffic management, consumables etc

Out turn %	Laxton's Methodology	Sirhowy Enterprise Way
Others Included: Kerbs, footways, stats, environmental, fencing, street lighting etc	10%	11%

Table 11.2: Comparision:

11.9.2 *Details of Carriageway Construction Rate*

The rate used for carriageway construction is based on current market rates.

The table below shows comparisons to previous schemes in south east Wales.

Scheme	Length of scheme	Original Estimated Cost	Rate used	Date Base	Inflate Rate up to Jan 06	Form of construction	% length of structures	Out turn Costs
Sirhowy Enterprise Way	4.3km	£38.4m	£37.01	2003	£43.73	Wide single/single	10%	£37.7m
Newport Southern Distributor Road	9.3km	£55.8m	£29.00	1999	£44.75	Dual	10%	£54.9m
Cwm By-Pass	2.4km	£18m	£30.66	2000	£45.75	Single	75%	£21m

Table 11.3 Comparison of Carriageway Construction Rates

The costs that are included within each of the following sections (12.0, 13.0 and 14.0) include those that might be associated with the bridge over the railway (Network Rail fees and compensation – 25%), and those associated with risk. The Department of Transport publication WebTAG Unit 3.5.9: The Estimation and Treatment of Scheme Costs suggest that during the early stages of scheme preparation (Stage 1), an uplift of 44% is applied to costs. Risk includes the following, which may or may not be an issue but due to the concept nature of the proposal, they are worthy of mention. They relate to known issues within the area through which the options pass.

- Archaeology;
- Ecology;
- Land contamination;
- Compulsory Purchase Orders;
- Unknown covenants,
- Sits of Special Scientific Interest (SSSIs);

- Unidentified statutory undertakers' apparatus;
- Land acquisition;
- Public opposition;
- Accommodation Works.

As the scheme progresses into the preliminary design stage, many of the above risks will be addressed and it should be possible to use optimism bias to reduce the uplift in costs.

11.10 Other Options Considered

As well as the three Link Road options that are described in Sections 12.0, 13.0 and 14.0 below, others have been briefly considered. In general, these have come from suggestions made by Breckland Council. These are described below, together with brief comments on their suitability as part of a Link Road.

11.10.1 Other combinations of terminal points on London Road and B1077

As stated in 11.8 above, there are potentially nine Link Road options that could be considered. The three that are described in subsequent sections of this report are sufficiently different enough from each other to stand up on their own.

11.10.2 The use of New Road as part of the Link Road

New Road, which links London Road with Hargham Road on the outskirts of the built-up area of Attleborough, would require widening to 7.3 metres, which may well affect existing accesses. It will also result in amenity impact on the residential properties that front onto this road. The use of New Road would also impact upon the planned development on the allocated Open Space at its junction with London Road.

Continuing this road east will result in the loss of the Marrisons Electrical building or some of the properties/buildings at the Hargham Road/Fowler's Lane junction. Fowler's Lane gives direct access to a number of properties and this will have to be retained in some way if the Link Road followed this route.

12. Option 1

(Drawing Number CS/060269/SK01)

12.1 DESCRIPTION

Option 1 has been conceived as an attempt to provide a complete Link Road that is suitable for development traffic and diversionary traffic as well as having attributes that are attractive to non motorised modes of transport. For this to be the case, it should have standards that are appropriate for all users. *Street-like* and *link road-like* environment characteristics are described in sub-section 11.7. Only *link road-link* characteristics are in keeping with a Design Speed of 100kph (60mph).

The AADT traffic flows in the first development year scenario, 2017 (see Section 10.0) are extremely low at 1300 vehicles and this will include no more than 10% diversionary traffic. However, by 2031 they will be in the region of 7300. In accordance with Design Manual for Roads and Bridges, Volume 5, Section 1, Part 3, TA46/97 – Economic Assessment and Recommended Flow Ranges for New Rural Road Links, these flows give a carriageway standard of S2 (7.3 metre carriageway width). Although Option 1 will pass through the centre of the development, a rural road standard is considered applicable as eventually traffic flows will reach a level more in keeping with it. A road width below 7.3 metres is not considered appropriate.

Although the western end of Option 1 has been designed with standards appropriate to a 100kph (60mph) Design Speed, it is likely that a lower speed limit, such as 40mph would be adopted due to the speed limit that will have to be adopted over the railway (see below). This speed limit will apply through the main part of the development as well although this is higher than the speeds appropriate for *street-like* characteristics as described in 11.7. The horizontal alignment over the majority of Option 1 as described will therefore have to be engineered to include some of the features and characteristics that a *street-like* environment should ideally have. The implications of this are discussed below.

Option 1 commences on London Road as close as it is possible to get to Attleborough without impacting upon existing development. This is the most northerly of the three London Road connection points that are described in sub section 11.2. The four arm roundabout junction will allow for the Link Road, the existing roads, and development to the west. It lies immediately to the south of Victory Park, a proposed General Employment Area. East of the roundabout, a 1020 metre radius will cross fields towards Hargham Road on a 1% down grade passing close to the south east corner of Victory Park as it does so. The alignment will allow a speed limit of 60mph. The change in speed limit on London Road (60mph/40mph) at the start of the built-up area should be relocated south to the new roundabout junction.

Hargham Road is at its closest to the railway at this location (150 metres), although it will still be possible to provide a connection with Option 1. Hargham Road will be slightly elevated above the existing road level, which will necessitate regrading the road to the north and south to achieve connections. Any greater elevation increase will impact upon properties nearby (*The Manor* and *Haverscroft*). Option 1 assumes connections to the north and south with the one to the north being for buses only joining the Link Road from Hargham Road, which will allow an anticlockwise bus route. The access to the south will likely have a ghost island junction arrangement and will be for local movements. It is suggested no general access is provided onto Hargham Road north from the Link Road to the west to discourage its use as a possible rat-run. Bus provision is discussed in Section 18.0: Sustainable Transport Links.

From Hargham Road, Option 1 rises on a gradient up to 5.3% with a straight horizontal alignment passing between the above two properties. It then passes perpendicularly over the Cambridge to Norwich railway on a low standard crest, which will only be appropriate for a 30mph speed limit. It passes to the south of Ivy Cottage and Levi Cottages and crosses Poplar Road, 125 metres east of the railway. This short distance will not allow an at-grade connection with Option 1 and the Link Road will still be elevated after crossing the railway on a down-grade. A number of sub-options exist in relation to access to Poplar Road.

A: Poplar Road could be severed completely where the Link Road crosses it. This will mean that both level crossings will have to continue being used in order that vehicular access to Hargham Road is maintained. The Bridleway that follows Poplar Road will be severed as well. This sub-option will allow the vertical alignment of Option 1 to reduce in elevation immediately after passing over the railway, which will reduce the visual impact on nearby properties.

B: Poplar Road could be severed but an underpass provided. The two level crossings could be closed to vehicles but retained for pedestrians and cyclists, maintaining the Bridleway. This could be attractive to Network Rail. The underpass will only require headroom of 2.7 metres for pedestrians and cyclists. Vehicular access to Poplar Road would be via two separate links from the north and southern halves to the Link Road. This will require a staggered junction arrangement with ghost island markings. The provision of an underpass with limited headroom will mean that the vertical alignment of Option 1 will still be able to reduce in elevation immediately after passing over the railway.

C: Poplar Road could be provided with an underpass that will be suitable for all vehicles and the Bridleway will be maintained. This will allow one of the two level crossings to be closed to vehicles (preferably the southern one), which could be attractive to Network Rail. This sub-option will require the vertical alignment of Option 1 to be kept at a higher elevation for a greater distance to the east after passing over the railway, which will result in greater visual impact on nearby properties.

The merits of each of the above sub-options are covered in 12.2: Discussion, below.

The Link Road will reach ground level at different distances east of Poplar Road depending upon the sub-option. These will vary between approximately 110 metres and 190 metres. This is approximately where the horizontal alignment curves to the left on a 510 metre radius passing to the south east of Poplar Farm. A 510 metre radius is appropriate for a speed limit no lower than 40mph. Just to the east of Poplar Road may be an appropriate location to provide a northern and southern connection to the Link Road.

From near ground level, Option 1 rises on a 1.4% gradient and a continuation of the 510 metre radius, which changes hand after approximately 450 metres. It passes to the north west of a former landfill site, which may include contamination. This general area is also identified as having some archaeological potential. The gradient reduces slightly as Option 1 goes into a shallow cutting as it approaches Leys Lane. It meets Leys Lane at existing ground level approximately 50 metres south of *Fine Furniture Exports* which will allow a connection to be made to the north and south.

To the east of Leys Lane, the 510 metre radius continues on a gradient of approximately 1%, which continues all the way to the B1077.Over this 750 metre distance, the horizontal alignment changes hand once again, passing through a small area of woodland. It then passes approximately 60 metres to the south of Docking Farm. Option 1 terminates at a three arm roundabout junction offset to the west of the B1077 Buckenham Road. This is the most northerly of the three B1077 connection points that are described in sub section 11.3 and is immediately to the north west of the northernmost property (The Foundry) at Foundry Corner. The position of the roundabout will allow a possible improvement (not shown) that will eliminate the sub standard bend through Foundry Corner with a new section of B1077 routed to the immediate west of the properties. A connection could be made into the existing alignment to the south although this has not been considered in any greater detail.

As Option 1 passes through the central part of the development and will have urban characteristics, lay-bys will not be required.

Apart from an area immediately to the west of the B1077 Buckenham Road within which the eastern termination point is located, all of Option 1 to the east of the railway is contained within the potential development land that is shown on Figure 1. To the west of the railway, only the field to the south of Victory Park is part of identified development land.

If Option 1 is part of a phased approach to providing access to the initial stages of development then the construction of its western section is preferable. This is outlined in Section 10.0: Future Traffic Flows. In terms of where the limit of construction could be, somewhere in the vicinity of Poplar Farm is suggested. This could be where one of the intermediate development junctions could be located.

12.2 Discussion

In its entirety, the provision of Option 1 as a road that will cater equally for diversionary traffic (including HGVs) and development traffic, and have a combination of *street-like* and *link road-like* characteristics will mean that a single road will be operating on two levels and will be 'all-purpose'. However, this will result in conflict where the roads with *street-like* characteristics will be used by the same diversionary traffic that will be using the higher standard section (with *link road-like* characteristics) to the west.

It is difficult to see how such a road can have characteristics that go below certain standards. A 7.3 metre wide carriageway width will be appropriate for the traffic flows on Option 1 (7300 in 2031) and the horizontal and vertical alignment standards are appropriate for 40mph. A carriageway width less than 7.3 metres is not recommended for such a road and a speed limit of 30mph (or lower) over the majority of Option 1 will only increase journey times for any diversionary traffic. This may make the use of the Link Road less attractive for many users, particularly those that live on the edge of Attleborough. Lower speed limits and lower vehicle speeds will also mean that pollutants from motor vehicles will increase with dispersion in the atmosphere likely to take longer. With Option 1 passing through the central part of the development, where residential properties could be at their densest, impacts on air quality are undesirable. The location of the Link Road will, irrespective of its standard give a degree of physical severance between the two halves of the development.

The introduction of other *street-like* characteristics, including numerous at-grade pedestrian crossings, and limited on-street parking will mean that journey times may not reduce to a level that will encourage Link Road use compared to using the town centre. This will cause frustration amongst drivers who are using the Link Road as a diversionary route.

Option 1 will be well placed for development traffic accessing Attleborough as the eastern and western terminal junctions are close to the town centre. In order that Hargham Road is not used as a means of access to the town centre, a bus only link onto the Link Road, as outlined above will stop this happening, forcing traffic to go west to London Road. There will be no means of access from Hargham Road south to Hargham Road north. The bus only link could be part of a circular bus route through the development. This is discussed in more detail in Section 18.0 Sustainable Transport Links.

Of the three sub-options outlined in the description, **B** is the least preferred as it introduces two additional junctions onto the Link Road that will require ghost island layouts. With approximately 6 properties served by each junction, provision would appear to be excessive and unwarranted and is not recommended in strategic terms. However, it may be attractive to Network Rail.

Sub-option **A** will mean that greater use will have to be made of the southern level crossing when most vehicles gravitate to the northern one at present and is where the crossing operative is based. This may well not be favoured by Network Rail.

Sub-option **C** is preferred and Network Rail may approve. However, the greater visual impact that would result would be a particular disbenefit.

At the western end of Option 1, the greater number of residential properties will mean that the Link Road will pass very close to a number, including *The Manor*, *Haverscroft, Ivy Cottage* and *Levi Cottage*. This will result in considerable impact, predominantly as a result of the railway crossing and its eastern and western approaches. Impacts will be many and varied and will include visual, traffic noise and vibration and a reduction in local air quality. The Link Road is likely to have an impact on the value of residential properties.

As outlined above and in Section 10.0: Future Traffic Flows, there will be low vehicle numbers on Option 1 in 2017 with only a small percentage of this diversionary in nature. However, this will have been displaced from Attleborough Town Centre where improvements will be appropriate for lower traffic flows than at present. On this basis, the provision of a full Link Road extending from London Road to the B1077 is considered appropriate. However, its full potential will not be realised until the years leading up to 2031, when traffic flows will be more appropriate for the road standard. A phased approach to the Link Road will mean that diversionary traffic will receive no benefit for a long time and HGVs will have to continue to use inappropriate roads in and around the Town Centre. Further information on phasing of the Link Road is contained in Section 10.0.

The impact of development traffic with Option 1 is contained in Section 10.0: Future Traffic Flows.

12.3 Cost Estimate

The two indicative costs that are shown are for the full Option 1, and the western section from London Road to the Poplar Farm area. The latter assumes a phased approach to Link Road provision. It should be noted that in each case, the cost of the bridge element is included in the main cost.

Link Road Option 1	£9.55 million (bridge element £1.98 million)
Link Road Option 1 (western section)	£5.94 million (bridge element £1.98 million)

Costs exclude design and site supervision costs, land acquisition and alterations to statutory undertakers' apparatus. Reference should be made to Section 11: Development of Options as to the basis of the above costs and how they have taken into account factors that cannot readily be priced at this stage, or those associated with risk.

12.4 Standards

(based on Option 1 with sub-option C)

Design Speed	100A kph
Speed limit	40mph between London Road and Hargham Road 30mph between Hargham Road and intermediate junction 40mph between intermediate junction and the B1077
Length	2.6 kilometres (approximate)
Total Area	6.67 hectares (approximately)
Carriageway width	7.3 metres (without application of *street-like* features)
Verge width	0.5 metres (margin separating carriageway from footway)
Footway widths	3.0 metres minimum (shared with cyclists)
Vertical clearance at railway	Minimum 5.1 metres
Horizontal alignment	London Road to Hargham Road - 1020 metre radius Hargham Road to Poplar Road - Straight Poplar Road to B1077 - 3 x 510 metre radii
Vertical alignment	London Road to Hargham Road - 1% down grade Hargham Rd to intermediate junction - Up to 6% down grade Up to 4% down grade Intermediate junction to B1077 - Up to 1.4% up grade
Lay-by provision	None required

Further horizontal and vertical alignment details can be found on Drawing Number CS/060268/SK01.

12.4.1 DEPARTURES

No Departures from Standards are reported.

12.5 MAIN CHARACTERISTICS

The main characteristics/implications of Option 1 are as follows (in no particular order):

- Length 2.6 kilometres (approximately);
- Total Area 6.67 hectares (approximately);
- Closest option to Attleborough;
- Crosses the railway perpendicularly;
- Would possibly allow an improvement to the B1077 at Foundry Corner;
- The majority of the Link Road will have a speed limit of 40mph;
- Hargham Road will be able to connect to the Link Road to the south for all traffic;
- Hargham Road will have a bus-only link from the north;
- The horizontal alignment associated with the 40mph speed limit will not be entirely appropriate for the creation of *street-like* environment characteristics;
- There are three variations at Poplar Road, with the provision of an underpass beneath the Link Road favoured;
- Due to its dual purpose role, its location and vehicle composition, the Link Road will still be a form of severance between the northern and southern parts of the development;
- Between London Road and Poplar Road, the elevated Option 1 will pass close to a number of residential properties;
- Passes through an area of high archaeological potential;
- A bus route could utilise the Link Road and the above connections;
- The majority is contained within identified potential development area (northern part);
- Section between London Road and the railway, and at the eastern B1077 end passes through land not identified for development;

- Does not provide a direct access from either Bunn's Bank or Gaymers Industrial Estates;
- Would give an opportunity to extend the Link Road north westwards in the future;
- Apart from in the vicinity of the railway, relatively close to existing ground level.
- An intermediate connection to the development to the south east of Poplar Farm could be provided if the road was to be phased;
- A connection with Leys Lane could be provided, which could also be a link into the development;
- BT Utilities may be affected on Hargham Road and Poplar Road
- National Grid LHP gas mains may be affected to the south of Docking Farm

12.6 Performance Against Objectives

Option 1 has been measured against the objectives stated in Section 5.0.

Objective	Objective met?	Comments
To cater for traffic generated by the proposed development to the south of Attleborough	Yes	Link Road will pass through the northern part of the development and will provide good links to the east and west as well as to Attleborough town centre
To reduce traffic impact in Attleborough town centre	Yes	When combined with the promotion of recommended alternative routes for general traffic and weight restrictions for goods vehicles
To act as a diversionary route for traffic between London Road and the B1077 (and vice versa)	Yes, partly	The location is well placed to attract traffic that is already on the fringes of the town as well as longer distance traffic. However, the inclusion of street-like features may restrict its use for some
To provide a more appropriate means of access to and from Bunn's Bank and Gaymers Industrial Estates in relation to the wider highway network	Yes, partly	Both estates will benefit although neither will have direct access to the Link Road.
To function as an integrated public transport route	Yes	Will provide good public transport links throughout development and to Attleborough town centre to the north. Could include Hargham Road, the B1077 and the train station. However, routes will have to cross Link Road.

Objective	Objective met?	Comments
To provide *street-like* road characteristics to the east and *link road-link* road characteristics to the west	Yes, partly	The alignment will only partly allow this. A low speed limit (20mph), that would be appropriate to *street-like* characteristics will not benefit through or Heavy Goods Vehicle traffic. There will only be a short section with *link road-like* characteristics including a 60mph speed limit to the west.

Table 12.1 Option 1 – Performance Against Objectives

12.7 BENEFITS AND DISBENEFITS

Benefits	Disbenefits
Horizontal alignment could allow the introduction of some *street-like* characteristics	Is not wholly contained within identified land
The alignment of the B1077 at Foundry Corner could be improved if desired	If *street-like* characteristics are provided, this will be less appropriate for diversionary and HGV traffic
Poplar Road will be retained	Passes through an identified area of high archaeological potential
Vertical alignment will allow an at-grade connection to the east of the railway and at Leys Lane for development/phasing (if appropriate)	Considerable visual impact at properties in vicinity of Hargham Road and the railway (railway crossing)
Link Road crosses the railway perpendicularly	Does not provide a direct connection from industrial estates
Avoids the flood zone	Road passing through central part of development will be a cause of community severance despite having *street-like* characteristics
Would give the opportunity to extend Link Road to the north east in the future	Impact on air quality due to low traffic speeds and dense development close to the Link Road
Hargham Road could be connected with a link to the north part of a bus route through the development.	*Street-like* characteristics will not help reduce journey times
Shortest option	Traffic flows will be initially low and may not justify a full Link Road
Least expensive option as a full Link Road (£9.55 million) and as part of a phased approach (£5.94 million)	
Smallest total area	

Table 12.2 Option 1 – Benefits and Disbenefits

13. Option 2

(Drawing Number CS/060269/SK02)

13.1 DESCRIPTION

In a similar way to Option 1, Option 2 has been conceived as one that attempts to provide a Link Road that is suitable for development traffic and diversionary traffic. As a result, it has adopted many of the former option's standards but located in a more central position within the identified potential development area. *Street-like* and *link road-like* environment characteristics are described in sub-section 11.7. Such characteristics are not in keeping with a Design Speed of 100kph as described in Section 7.0 and therefore Option 2 has been designed with standards appropriate to 70kph (40mph speed limit) throughout. This includes the western section over the railway. The horizontal alignment over the majority of Option 2 as described will therefore have to be engineered to include some of the features and characteristics that a *street-like* environment should ideally have.

The AADT traffic flows in the first development year scenario, 2017 (see Section 10.0) are extremely low at 1300 vehicles. However, by 2031 they will be in the region of 7300. In accordance with Design Manual for Roads and Bridges, Volume 5, Section 1, Part 3, TA46/97 – Economic Assessment and Recommended Flow Ranges for New Rural Road Links, these flows give a carriageway standard of S2 (7.3 metre carriageway width). Although Option 2 will pass through the centre of the development, a rural road standard is considered applicable as eventually traffic flows will reach a level more in keeping with it. A road width below 7.3 metres is not considered appropriate.

Option 2 commences on London Road close to *Haverscroft House Farm*, which may require a direct vehicular connection with the roundabout junction. The four arm roundabout junction Will allow for the Link Road, the existing roads and development to the west and is in the central position of the three described in sub section 11.2. East of the roundabout, a straight horizontal alignment with a gradient up to approximately 3.5% will cross fields down towards Hargham Road. As it approaches Hargham Road, Option 2 will pass between *Haverscroft Farm* and *Haverscroft Grange*.

Option 2 assumes connections to the north and south at Hargham Road with the one to the north being for buses only joining the Link Road from the north. The access to the south will likely have a ghost island junction arrangement and will be for local movements. Bus provision is discussed in Section 18.0 Sustainable Transport Links. The change in speed limit on London Road (60mph/40mph) at the start of the built-up area should be relocated south to the new junction.

From Hargham Road, which will be in a sag curve, Option 2 rises on a gradient up to approximately 6.1% with a straight horizontal alignment. Continuing, it passes perpendicularly over the Cambridge to Norwich railway on a crest curve, appropriate for a 40mph speed limit. Option 2 passes to the south of *Alder Farm*, descending on a gradient of up to 2% as it does so.

As the flood zone shown on the Constraints Plan (Drawing Number CS/062268-02) extends east of the railway, it will be necessary to keep Option 2 elevated above existing ground level. The appropriateness of this will require discussions with the Environment Agency. On a sag curve with a left hand 510 metre radius, the vertical alignment continues east before climbing on a 0.5% gradient, reaching ground level to the north west of Leys Farm. . Links into the development to the north and south could be provided here, which could also be part of the internal bus route. Option 2 severs a public footpath, which will require rerouting, before it crosses Fowler's Lane. Continuing at near ground level and an up gradient of 2% and a 510 metre radius of the opposite hand, Option 2 crosses Leys Lane where connections to the north and south into each half of the development will be provided. This is where there is a former landfill site and the Link Road will pass close to its south eastern edge. The general area also has some archaeological potential.

Continuing east, the gradient reduces to 0.5% in a slight cutting on a 510 metre radius until the horizontal alignment changes to one of the opposite hand. The option passes through the edge of another area of archaeological potential before assuming a straight alignment to a three arm roundabout junction offset to the west of the B1077 Buckenham Road. This location is immediately to the south of the southernmost property at Foundry Corner (Bethany) and west of a water pumping station. Both will be avoided.

As Option 2 passes through the central part of the development, lay-bys will not be required.

Between the railway and the B1077, apart from land to the south of Alder Farm, all of Option 2 is contained within potential development land that is shown on Figure 1. However, all land between the railway and London Road is outside of this area.

If Option 2 is part of a phased approach to providing access to the initial stages of development then the construction of its western section is preferable. This is covered in Section 10.0: Future Traffic Flows. In terms of where the limit of construction could be, somewhere to the north west of Leys Farm is suggested. This could be where one of the intermediate development junctions could be located.

13.2 DISCUSSION

The aims of Option 2 are broadly similar to Option 1 and the traffic flows on it will be using it are the same. To recap, in its entirety, it will cater predominantly for development traffic, but also diversionary traffic (including HGVs), and have a combination of street-like and link road-like characteristics meaning that a single road will be operating on two levels and will be 'all-purpose'. However, this will result in conflict where the roads with street-like characteristics will be used by the same diversionary traffic that will be using the higher standard section (with link road-like characteristics) to the west.

The discussion with regard to the appropriateness of Option 2 for development and diversionary traffic is the same as for Option 1 and this should be referred to.

Option 2 will be well placed for development traffic accessing Attleborough as the eastern and western terminal junctions are reasonably close to the town centre. In order that Hargham Road is not used as a means of access to the town centre, a bus only link onto the Link Road, as outlined above will stop this happening, forcing traffic to go west to London Road. There will be no means of access between Hargham Road south and Hargham Road north. The bus only link could be part of a circular bus route through the development. This is discussed in more detail in Section 18.0 Sustainable Transport Links.

At the western end of Option 2, the Link Road will pass very close to a number of properties, including *Haverscroft Farm* and *Haverscroft Grange*. This will result in considerable visual impact, predominantly as a result of the railway crossing and its eastern and western approaches.

There will be low vehicle numbers using Option 2 in 2017. With only a small percentage that is diversionary in nature. However, this will have been displaced from Attleborough Town Centre where improvements will be appropriate for lower traffic flows than at present. On this basis, the provision of a full Link Road extending from London Road to the B1077 is considered appropriate. However, its full potential will not be realised until the years leading up to 2031, when traffic flows will be more appropriate for the road standard. A phased approach to the Link Road will mean that diversionary traffic will receive no benefit for a long time and HGVs will have to continue to use inappropriate roads in and around the Town Centre. Further information on phasing of the Link Road is contained in Section 10.0.

The impact of development traffic with Option 2 is contained in Section 10.0: Future Traffic Flows.

13.3 Cost Estimate

The two indicative costs that are shown are for the full Option 2, and the western section from London Road to the Leys Farm area. The latter assumes a phased approach to Link Road provision. It should be noted that the cost of the bridge element is included in the main cost.

Link Road Option 1	£13.1 million (bridge element £1.98 million)
Link Road Option 1 (western section)	£8.03 million (bridge element £1.98 million)

Costs exclude design and site supervision costs, land acquisition and alterations to statutory undertakers' apparatus. Reference should be made to Section 11: Development of Options as to the basis of the above costs and how they have taken into account factors that cannot readily be priced at this stage, or those associated with risk.

13.4 STANDARDS

Design Speed	100A kph
Speed limit	40mph throughout
Length	2.9 kilometres (approximate)
Total area	8.95 hectares (approximate)
Carriageway width	7.3 metres (without application of *street-like* features)
Verge width	0.5 metres (margin separating carriageway from footway)
Footway widths	3.0 metres minimum (shared with cyclists)
Vertical clearance at railway	Minimum 5.1 metres
Horizontal alignment	London Road to east of railway - Straight East of railway to near Leys Cottage - 510 metre radius Leys Cottage to east of Leys Lane - 510 metre radius East of Leys Lane to west of B1077 - 510 metre radius Approach to B1077 from west - Straight
Vertical alignment	London Road to Hargham Road – 3.5% down grade Hargham Rd to intermediate junction – 6.1% up grade 5.6% down grade Intermediate junction to B1077 – 0.5% up grade 2% up grade 0.5% up grade
Lay-by provision	None required

Further horizontal and vertical alignment details can be found on Drawing Number CS/060268/SK02.

13.4.1 DEPARTURES

No Departures from Standards are reported.

13.5 MAIN CHARACTERISTICS

The main characteristics/implications of Option 2 are as follows (in no particular order):

- Length 2.9 kilometres approximately;
- Total area 8.95 hectares approximately;
- Passes through near central area of potential development area;
- Crosses the railway perpendicularly;
- The whole of the Link Road will have a speed limit of 40mph;
- Hargham Road will be able to connect to the Link Road to the south for all traffic;
- Hargham Road will have a bus-only link from the north;
- The horizontal alignment associated with the 40mph speed limit will not be entirely appropriate for the creation of *street-like* environment characteristics;

- Due to its dual purpose role, its location and vehicle composition, the Link Road will still be a form of severance between the northern and southern parts of the development;
- Between London Road and east of the railway, the elevated Option 2 will pass close to a number of residential properties;
- Passes through two areas with high archaeological potential;
- An intermediate connection to the development to the north west of Leys Farm could be provided if the road was to be phased;
- The Link Road will have to be elevated where it crosses the northern part of the flood zone;
- A connection with Leys Lane could be provided, which could also be a link into the development;
- A bus route could utilise the Link Road and the above connections;
- The majority is contained within identified potential development area;
- Section between London Road and east of the railway passes through land not identified for development;
- Passes through areas with Environmental Stewardship Agreements;
- Severs public footpath near Fowler's Lane;
- Reasonably close to Bunn's Bank Industrial Estate but not Gaymers Industrial Estate;
- Would give an opportunity to extend the Link Road north westwards in the future;
- Apart from in the vicinity of the railway, relatively close to existing ground level;
- An intermediate connection to the development to the north west of Leys Farm could be provided if the road was to be phased;
- BT Utilities may be affected on Hargham Road; and
- National Grid LHP gas mains may be affected to the north east of Leys Cottage.

13.6 Performance Against Objectives

Option 2 has been measured against the objectives stated in Section 5.0.

Objective	Objective met?	Comments
To cater for traffic generated by the proposed development to the south of Attleborough	Yes	Link Road will pass through the central part of the development and will provide good links to the east and west as well as to Attleborough town centre
To reduce traffic impact in Attleborough town centre	Yes	When combined with the promotion of recommended alternative routes for general traffic and weight restrictions for goods vehicles
To act as a diversionary route for traffic between London Road and the B1077 (and vice versa)	Yes, partly	The location is well placed to attract traffic that is already on the fringes of the town as well as longer distance traffic. However, the inclusion of street-like features may restrict its use for some.
To provide a more appropriate means of access to and from Bunn's Bank and Gaymers Industrial Estates in relation to the wider highway network	Yes, partly	Bunn's Bank Industrial Estate will benefit as it is closer to the Link Road. Slightly less beneficial for Gaymers Industrial Estate.
To function as an integrated public transport route	Yes	Will provide good public transport links throughout development and to Attleborough town centre to the north. Could include Hargham Road, the B1077 and the train station. However, routes will have to cross Link Road.
To provide *street-like* road characteristics to the east and *link road-link* road characteristics to the west	Yes, partly	The alignment will only partly allow this. A low speed limit (20mph), that would be appropriate to *street-like* characteristics will not benefit through or Heavy Goods Vehicle traffic. The western end will, in keeping with the rest of the Link road, have a speed limit of 40mph with *link road-like* characteristics.

Table 13.1 Option 2 – Performance Against Objectives

13.7 Benefits and Disbenefits

Benefits	Disbenefits
Horizontal alignment could allow the introduction of some *street-like* characteristics	Is not wholly contained within identified land
Link Road crosses the railway perpendicularly	If *street-like* characteristics are provided, this will be less appropriate for diversionary and HGV traffic
Vertical alignment will allow an at-grade connection to the east of the railway and at Leys Lane for development/phasing (if appropriate)	Considerable visual impact at properties in vicinity of Hargham Road and the railway (railway crossing)
Would give the opportunity to extend Link Road to the north east in the future	Passes through two identified areas of high archaeological potential
Hargham Road could be connected with link to the north part of a bus route through the development.	Public Right of Way affected at Leys Lane/Fowler's Lane
Constant 40mph speed limit throughout with consistent standards	Road passing through central part of development will be a cause of community severance despite having *street-like* characteristics
Both industrial estates will benefit although neither will have direct connections with the Link Road	Crosses the flood zone requiring an elevated alignment
	Impact on air quality due to low traffic speeds and dense development close to the Link Road.
	Street-like characteristics will not help reduce journey times on the Link Road

Table 13.2 Option 2 – Benefits and Disbenefits

14. Option 3

14.1 DESCRIPTION

Due to its location towards the southern part of the potential development site, Option 3 will effectively become its southern boundary and of Attleborough as a whole. It should have standards appropriate to a road that will not have any frontage development and few junctions. The standards that have been adopted with Option 3 are based on a 100kph Design Speed, which was determined in Section 7.0. This will mean that the characteristics of Option 3 will be wholly appropriate for through traffic and will therefore not contain any *street-like* features such as are listed in sub section 10.7. It will therefore have *link road-like* environment characteristics and the speed limit will be 60mph apart from the railway crossing.

The AADT traffic flows in the first development year scenario, 2017 (see Section 10.0) are extremely low at 1300 vehicles. However, by 2031 they will be in the region of 12300 with the SC2 employment scenario and 14900 with the SC1 employment scenario. In accordance with Design Manual for Roads and Bridges, Volume 5, Section 1, Part 3, TA46/97 – Economic Assessment and Recommended Flow Ranges for New Rural Road Links, the lower flow gives a carriageway standard of S2 (7.3 metre carriageway width) and the higher flow a carriageway width of 10 metres (WS2). As Option 3 will form the southern edge of the development, a rural road standard is considered entirely appropriate. It is recommended that the lower carriageway width will be more appropriate as the higher AADT flow is dependant on a particular development scenario that may not be realised.

Option 3 commences at an at-grade three-arm roundabout junction on London Road approximately 60 metres north of the Peter Beales/Sweet Briars Garden Centre. The four arm roundabout junction will allow for the Link Road, the existing roads and development to the west.

From the roundabout, Option 3 goes south east on a straight horizontal alignment and a down gradient up to 3.5% across a field to meet Hargham Road. The need for a connection to the Link Road is discussed in sub section 11.5 but for Option 3 just a bus only link onto the Link Road from the north has been assumed. This will be at approximately existing ground level. There are very few properties to the south of Hargham Road and therefore a connection is not considered necessary. A more southerly section of Hargham Road will give east/west access between the A11 and the B1077.

There is a flood zone in the vicinity of Option 3 which extends west from near Hargham Road towards Leys Lane and north towards Poplar Road (see Constraints Plan, Drawing Number CS/062268/02). This is a constraint to Option 3, which presents a challenge that requires an engineering solution. Due to the flood zone straddling the railway, it will be necessary to keep the vertical alignment of Option 3 elevated as far as possible after crossing it. Combined with its necessary elevation to the west of the railway, it will be possible to provide a Link Road crossing the full width of the flood zone beneath which the flooding issue can be accommodated. The appropriateness of this will require discussions with the Environment Agency. As well as being a flood zone, part of this area has high archaeological potential.

With a limited movement junction arrangement on Hargham Road, Option 3 climbs on a gradient of up to 6.1% with a left hand 510 metre horizontal curve on the approach to the crossing of the railway. It then passes over the railway on a straight horizontal alignment (with a slight skew) and a crest curve that is appropriate to a 40mph speed limit. Despite the intention of Option 3 to be a high standard road with a speed limit appropriate to its role, the crossing of the railway and provision of a connection with Hargham Road will mean that this is compromised. On the east side of the railway bridge a straight gradient of 5.6%, sag curve, 0.5% gradient and a 510 metre radius will take Option 3 to ground level to the south of Leys Farm.

As discussed in Section 11.6, a connection of Leys Lane with the Link Road is likely to be necessary to allow development traffic to go east towards the B1077 and west towards the A11 Trunk Road. It could be part of a bus route associated with the Hargham Road junction. Due to Option 3 passing along the southern boundary of the development, there will not be the need to connect the southern section of Leys Road to the Link Road due to the few properties that it serves and the east/west Hargham Road to the south (1.9 kilometres distant). It would be undesirable in strategic terms given the more *link road-like* that this option will be. Given its standards and the intention to provide a flowing alignment, it will difficult to locate Option 3 fully within the ASHAAP boundary (see Figure 1.2) whilst still passing to the south of Leys Farm.

East of Leys Lane, Option 3 continues on a 510 metre radius before going onto a slight embankment. It is in this general area that a second link to the development could be provided. This will be to the north only. It could be associated with a bus route.

A 0.5% gradient continues to the B1077 on a straight horizontal alignment. Although the main Bunn's Bank Scheduled Monument lies adjacent to the south side of Bunn's Bank Road, a ditch associated with it lies west of the B1077 and this will be avoided with Option 3. However, this general area is identified on the Constraints Plan as having high archaeological potential. The four-arm roundabout junction will be located slightly offset to the west of the B road. This junction is also close to the edge of the identified development land. Links to the B1077 to the north and south will be provided together with a link into Bunn's Bank Road. If a bus route through the development used the eastern end of the Link Road and the B1077 Buckenham Road, a bus stop could be provided close to Bunn's Bank Industrial Estate and at other locations on the approach to Attleborough. In relation to the industrial estate, a bus stop would benefit those working there.

At stated earlier, it is likely that Option 3 could become the southern boundary of the development. Its eastern section is located close to the edge of development and this is also the case to the immediate east of the railway. However, between these sections there is an area of identified potential development land that lies up to approximately 400 metres to the south and shown on Figure 1. If Option 3 is seen as a southern boundary to the development, it would be preferable if this area was not developed as otherwise the high standard Link Road will have the effect of severing it from the main development to the north.

Due to its location, it is likely that Option 3 will require a lay-by in each direction.

The whole of Option 3 between the railway and the B1077 is contained within the identified development area. However, between London Road and the railway, the option has to cross land outside of what has been identified for this purpose.

The issue of traffic and development scenarios, including the phasing of the development is covered in more detail in Section 9.0: Development Scenarios and Section 10.0: Future Traffic Flows. However, specific implications with regard to Option 3 are outlined below.

In contrast to Options 1 and 2, the phasing of the development in relation to Option 3 is less desirable as the Link Road is in a location better suited for through traffic. This is due to the distance between development and Link Road, which will mean a long access road will be required if the first phase occurs in the north western section of the identified area. Even when the development is complete, all trips into and out of the area will be associated with the Link Road.

If either an additional access was provided on the B1077 between Bunn's Bank Industrial Estate and Slough Lane or Leys Lane was upgraded then local traffic would have a more convenient route into and out of the development. An additional crossing of the railway for the development is unlikely to be provided. Option 3 is in a less convenient location for local development traffic and has greater suitability for through traffic, which will mean that it is better placed for the promotion of sustainable transport links into Attleborough town centre. This is discussed further in Section 18.0.

Although it is unlikely to be the case, a phased approach to development with Option 3 could be associated with a junction to the south west of Leys Farm. This could be Leys Lane itself. A second development junction could be provided approximately mid way between Leys Farm and the eastern end of Option 3.

14.2 Discussion

Due to its location at the southern edge of the development, Option 3 is a road that will cater predominantly for development traffic, but also diversionary traffic (including HGVs). Its overall low number of connections (3 in approximately 3.1 kilometres), good standard horizontal and vertical alignments, together with its 60mph speed limit over much of its length, will result in short journey times for diversionary traffic and traffic associated with the southern parts of the development. However with AADT traffic flows in 2017 being very low (1300 vehicles), which will only rise to between 12300 and 14900 in 2031, it's provision as part of the development may be difficult to justify.

Although Option 3 will be carrying mainly development traffic, it will not be actually within the development and hence *link road-link* characteristics will be more appropriate. The opportunity will exist to create a local highway network within the development to the north, which will be solely for generated traffic and will not be carrying diversionary traffic and the Heavy Goods Vehicles that will be associated with this. However this will have to be associated with links to the local highway network to the east and north.

A local highway network will be able to fully meet the criteria of a *street-like* environment, unaffected by through traffic. This will allow a community environment to be created without the severance that a Link Road passing through its centre would give. However, this may make its provision harder to justify in terms of funding as it will not be fulfilling an integral role within the development. Sustainable travel will be easier to promote.

Although Option 3 will require a crossing of the railway, its more southerly location will mean that it will be generally further away from residential properties.

As outlined above and in Section 10.0: Future Traffic Flows, there will be low vehicle numbers on Option 31 in 2017 with only a smaller percentage that is diversionary in nature. However, this will have been displaced from Attleborough Town Centre where improvements will be appropriate for lower traffic flows than at present. On this basis, the provision of a full Link Road extending from London Road to the B1077 is considered appropriate. However, its full potential will not be realised until the years leading up to 2031, when traffic flows will be more appropriate for the road standard. A phased approach to the Link Road will mean that diversionary traffic will receive no benefit for a long time and HGVs will have to continue to use inappropriate roads in and around the Town Centre. Further information on phasing of the Link Road is contained in Section 10.0.

The impact of development traffic with Option 3 is contained in Section 10.0: Future Traffic Flows.

14.3 Cost Estimate

The two indicative costs that are shown are for the full Option 3,and the western section from London Road to the Leys Farm area. The latter assumes a phased approach to Link Road provision although it does not include a link to the initial stage of the development, which has been assumed as being in the north west of the identified area. It should be noted that the cost of the bridge element is included in the main cost.

Link Road Option 3	£16.42 million (bridge element £1.98 million)
Link Road Option 1 (western section)	£9.68 million (bridge element £1.98 million)

Costs exclude design and site supervision costs, land acquisition and alterations to statutory undertakers' apparatus. Reference should be made to Section 11: Development of Options as to the basis of the above costs and how they have taken into account factors that cannot readily be priced at this stage, or those associated with risk.

14.4 STANDARDS

Design Speed	100A kph
Speed limit	40mph between London Road and east side of railway crossing 60mph between east side of railway crossing and the B1077
Length	3.1 kilometres (approximate)
Total area	9.4 hectares (approximate)
Carriageway width	7.3 metres with 1 metre hard strips
Verge width	0.5 metres (margin separating carriageway from footway)
Footway widths	3.0 metres minimum (shared with cyclists) – north side only
Vertical clearance at railway	Minimum 5.1 metres
Horizontal alignment	London Road to Hargham Road - Straight Hargham Road to railway crossing - 510 metre radius Railway crossing to Leys Lane - Straight Leys Lane to east of Leys Farm - 510 metre radius East of Leys Farm - Straight (short) East of farm to west end Bunn's Bank - 510 metre radius West end Bunn's Bank to B1077 - Straight
Vertical alignment	London Road to Hargham Road - 3.5% down grade (up to) Hargham Rd to railway crossing - 6.1% up grade Railway crossing to Leys Lane - 5.6% down grade Leys Lane to B1077 - 1% up grade
Lay-by provision	Type A or B (TD69/07) - 1 in each direction

14.4.1 DEPARTURES

No Departures from Standards are reported.

14.5 MAIN CHARACTERISTICS

The main characteristics/implications of Option 3 are as follows (in no particular order):

- Length 3.1 kilometres approximately;
- Total area 9.4 hectares approximately;
- Will be the southern development boundary;
- All development will be to the north giving the opportunity to provide a community-like environment free of through traffic;
- Commences on London Road at furthest point south whilst avoiding businesses. Could provide link to development area to west, if required;
- Provides a direct link from Bunn's Bank Industrial Estate;
- Less direct from Gaymers Industrial Estate;

- Will permit a 60mph speed limit over the majority of its length, with good standards for diversionary traffic and industrial estate traffic avoiding Attleborough town centre;
- A reduced speed limit of 40mph will be required from Hargham Road to the east side of the railway;
- Hargham Road will be linked from the north only with a bus connection;
- Leys Lane will be connected from the north only;
- A Leys Lane connection could be the eastern end of a part of a phased Link Road;
- One additional north-only connection between Leys Lane and the B1077;
- Part of the western section will pass through an identified flood zone with an extended structure over the railway crossing it;
- Passes through areas with Environmental Stewardship Agreements;
- Passes through two areas with high archaeological potential;
- Crosses the railway at a slight skew;
- Apart from western end, the majority contained within potential development area;
- Passes close to just a few properties in Hargham Road;
- A bus route could utilise part of the Link Road to access the development;
- Sustainable travel will be important within the development;
- No impact on Public Rights of Way;
- Eastern termination point at Bunn's Bank Road will not allow continuation of the Link Road north eastwards in the future;
- A Leys Lane connection could be the eastern end of a part of a phased Link Road;
- BT Utilities may be affected on Hargham Road;
- National Grid LHP gas mains may be affected to the south west of Leys Farm.

14.6 Performance Against Objectives

Option 3 has been measured against the objectives stated in Section 5.0.

Objective	Objective met?	Comments
To cater for traffic generated by the proposed development to the south of Attleborough	Yes	Link Road will pass along the southern edge of the development and will provide good links to the east and west as well as to Attleborough town centre. However, it will be less integral with the development and further away from the town centre
To reduce traffic impact in Attleborough town centre	Yes	When combined with the promotion of recommended alternative routes for general traffic and weight restrictions for goods vehicles.
To act as a diversionary route for traffic between London Road and the B1077 (and vice versa)	Yes	But traffic in the southern fringes of the town may not go all the way south to use the Link Road and may continue using town centre roads
To provide a more appropriate means of access to and from Bunn's Bank and Gaymers Industrial Estates in relation to the wider highway network	Yes	Both estates will benefit particularly Bunn's Bank, which will have a direct connection with the Link Road
To function as an integrated public transport route	Yes, partly	Less use of Link Road with no crossings required. Will also allow a public transport link to Hargham Road, Bunn's Bank Industrial Estate, the B1077, and the train station.
To provide *street-like* road characteristics to the east and *link road-link* road characteristics to the west	No	The location of the Link Road to the south of the development will mean that it will function more like a road for diversionary traffic. *Link road-like* only characteristics will be provided.

Table 14.1 Option 3 – Performance Against Objectives

14.7 Benefits and Disbenefits

Benefits	Disbenefits
Will form the southern boundary of the development and hence Attleborough	It may be harder to justify due to it not being obviously integral to the development
Apart from the western end, is wholly contained within development boundary	Is not wholly contained within identified land
Vertical alignment will allow an at-grade connection to the east of the railway and at Leys Lane for development/phasing	Passes through identified areas of high archaeological potential
Does not pass close to properties	No direct connection from Gaymers Industrial estate
Minimal visual impact	Longest option
Passes close to parts of southern development boundary	Link Road crosses railway at a slight skew
Hargham Road north can provide bus link onto Link Road and be part of a bus route through the development	Crosses the flood zone requiring an elevated alignment
Avoids Bunn's Bank Scheduled Monument	Eastern termination point will not allow any continuation north west
Links directly to Bunn's Bank Industrial Estate	Most expensive option as a full Link Road (£16.42 million) and as part of a phased approach (£9.68 million)
Allows a high standard road with a (mostly) 60mph speed limit	Traffic flows will be extremely low in the early years although they will reach more appropriate levels in years approaching 2031
2 northern-only links onto Link Road (Leys Road and one other) will stop development traffic using minor roads to the south	Largest total area
No Public Rights of Way affected	
Location will not give rise to any community severance (if a southern development boundary)	
Allows development to be free of through traffic	
Very well paced for diversionary traffic between the A11 and the B1077.	
It's location on the periphery of the development will mean that the sustainable travel can be heavily promoted	

Table 14.2 Option 3 – Benefits and Disbenefits

15. Ecological Assessment

15.1 Non-Technical Summary

Site Location and size	Attleborough, exact size of scheme not determined yet.
Scope of works	Desk Study
Purpose of works	To advise of potential for protected species on site and advise of further survey requirements.
Dates of site visits and names of surveyors	No access to the privately owned land was provided at this stage; therefore no site visit undertaken.
Overview of results	Potential presence of bats, otter, water vole, white-clawed crayfish and breeding/overwintering birds on site.
Recommendations for further surveys	Phase 1 habitat survey. Potentially require further protected species surveys depending upon results of Phase 1 survey, e.g. bat activity survey.
Recommendations for protection of ecological features of value	Retention of County Wildlife Sites and public open green spaces.
Recommendations for compensation and/or enhancement	N/a at this stage of scheme.

Dec	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov
Full Phase 1 Survey cannot occur				Optimal time for Phase 1 Habitat Survey and invasive species mapping to occur						Full Phase 1 Habitat Survey cannot occur	
Winter roost inspections can only occur				Bat activity and roost entry/exit surveys can occur						Winter roost inspections can only occur	
Reptile surveys cannot occur				Reptile habitat assessment and surveys can occur						Reptile surveys cannot occur	
Overwintering bird survey can occur				Breeding bird survey can occur						Overwintering bird survey can occur	

Table 15.1 Survey Timetable

15.2 INTRODUCTION

Capita Symonds was commissioned by Breckland Council to undertake a desk study of proposed routes for a link road in Attleborough. The requirement for this arises from a proposed development in Attleborough, which would include the following:

- 4,000 houses south of the railway
- 500 houses on the area between the A11 and railway
- 10 ha of employment land at London Road (around Haverscroft Industrial Area)
- A new retail supermarket south of the railway
- 2 primary schools south of the railway
- A new high school south of the railway, subject to confirmation from the Local Education Authority

15.2.1 OBJECTIVES OF STUDY

This study aims to evaluate the potential for protected and notable species and habitats that may require consideration prior, during and after development.

15.2.2 GENERAL SITE DESCRIPTION

The potential location of the bypass and development lies to the south of Attleborough and the M11. This area is referred to as the 'site' in the context of this report. The site appears to currently consist of existing industry, public green open spaces, archaeological features, woodland blocks, green lanes, public footpaths and residential housing. An airfield is also present further south of the proposed development area.

15.3 DESKTOP STUDY

15.3.1 METHODOLOGY

A desk study was conducted. Broad habitat boundaries and types were identified from OS maps and aerial photographs. The following organisations were consulted for ecological information about the site and surrounding areas. A request was made for information on any ecologically important areas and notable species within a roughly 3km buffer zone surrounding Attleborough.

The organisations consulted were:

- Breckland Council.

15.3.2 *Results – Statutory Designations*

Swangey Fen Site of Special Scientific Interest (SSSI), part of Norfolk Valley Fens Special Area of Conservation (SAC)

This site is located about 3km south west of Attleborough. The SSSI is designated because it contains an area of species-rich, spring-fed fen of a type that is otherwise largely restricted to the Norfolk Broads. Wet woodland and grassland surround the fen, increasing the interest of the site and helping to maintain a high water-table. The River Thet also passes through the site.

Norfolk Valley SAC

This site is primarily designated for its Annex l habitat Alkaline Fens. Annex l habitats that are also present as a qualifying feature, but not a primary reason for site selection are Northern Atlantic wet heaths with *Erica tetralix*; European dry heaths; Semi-natural dry grasslands and scrubland facies: on calcareous substrates (*Festuco-Brometalia*); *Molinia* meadows on calcareous, peaty or clayey-silt-laden soils (*Molinion caeruleae*); Calcaerous fens with *Cladium mariscus* and species of the *Caricion davallianae*; and Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion*, *Alno incanae*, *Salicion albae*). Annex ll species that are a primary reason for site selection are narrow-mouthed whorl snail (***Vertigo angustior***) and Desmoulin's whorl snail (***Vertigo moulinsiana***).

Old Buckenham Fen SSSI

This site lies approximately 3km south of Attleborough. This site is a valley fen which is underlain by the impermeable clays of a buried channel. The central part of the site consists of a species-rich, managed reedbed surrounding a small, natural mere. Around the margins of the fen basin are areas of species-rich scrub, drier fen and cattle-grazed meadows containing wet hollows and calcareous flushes. The meadows are divided by a network of dykes and are used by wading birds.

15.3.3 *Non-Statutory Designations*

The following are County Wildlife Sites (CWS) that lie within approximately 2km of Attleborough:

- Burgh Common
- 639 Fen Plantation
- 640 Tollgate Plantation
- 641 Woodland in Hargham
- 642 Hargham heath
- 644 Leys Plantation
- 632 East of Old Buckenham Fen
- 638 West of Old Buckenham Fen

- 634 West Moor
- 2064

Decoy common is also present within 2km of Attleborough, but is classified as a public open green space.

15.3.4 HABITATS

No Phase 1 habitat plans were provided with the desk study data, but using satellite maps habitats appear to consist of arable land, improved grassland, hedgerows and buildings.

15.3.5 SPECIES

The following species have been recorded within a 3km buffer zone of Attleborough:

European Protected Species

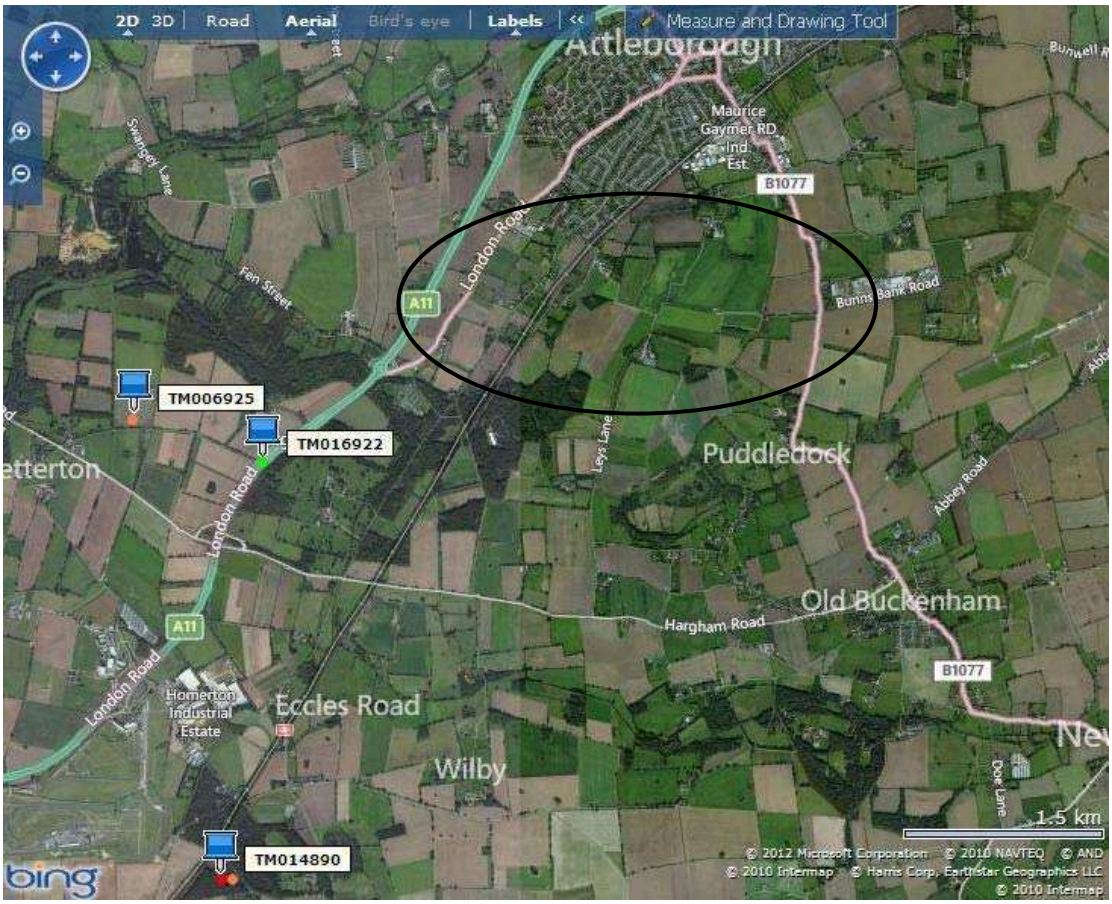
Mammals

- Barbastelle (*Barbastella barbastellus*)
- Brown long-eared bat (*Plecotus auritus*)
- Soprano pipistrelle (*Pipistrellus pygmaeus*)
- European otter (*Lutra lutra*)

Amphibians

Great crested newt records are present approximately 7km south west of Attleborough (NBN Gateway, accessed December 2012).

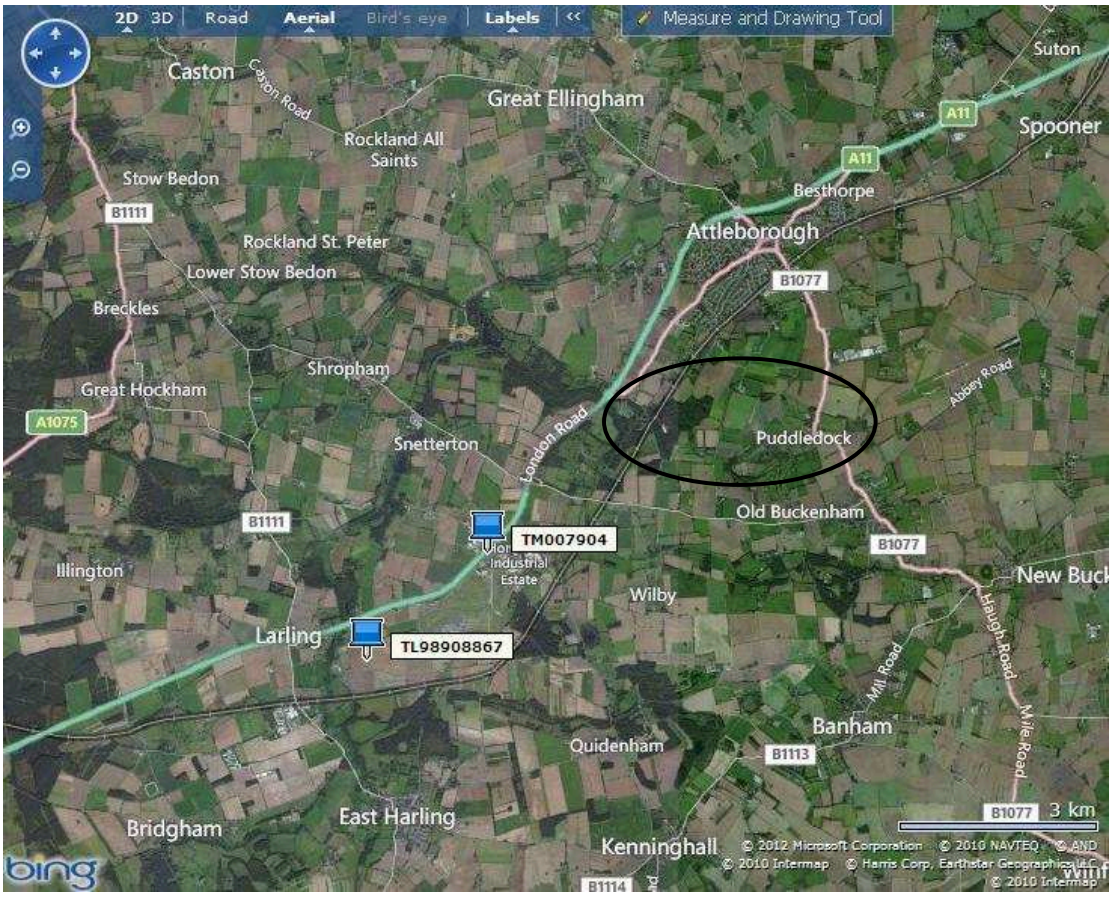
Records of pool frog were present approximately 15km south west of Attleborough (NBN Gateway). This species was reintroduced to the Breckland area near Thetford between 2005-2008 (Natural England).



Red = barbastelle; orange = brown long-eared; green = soprano pipistrelle.

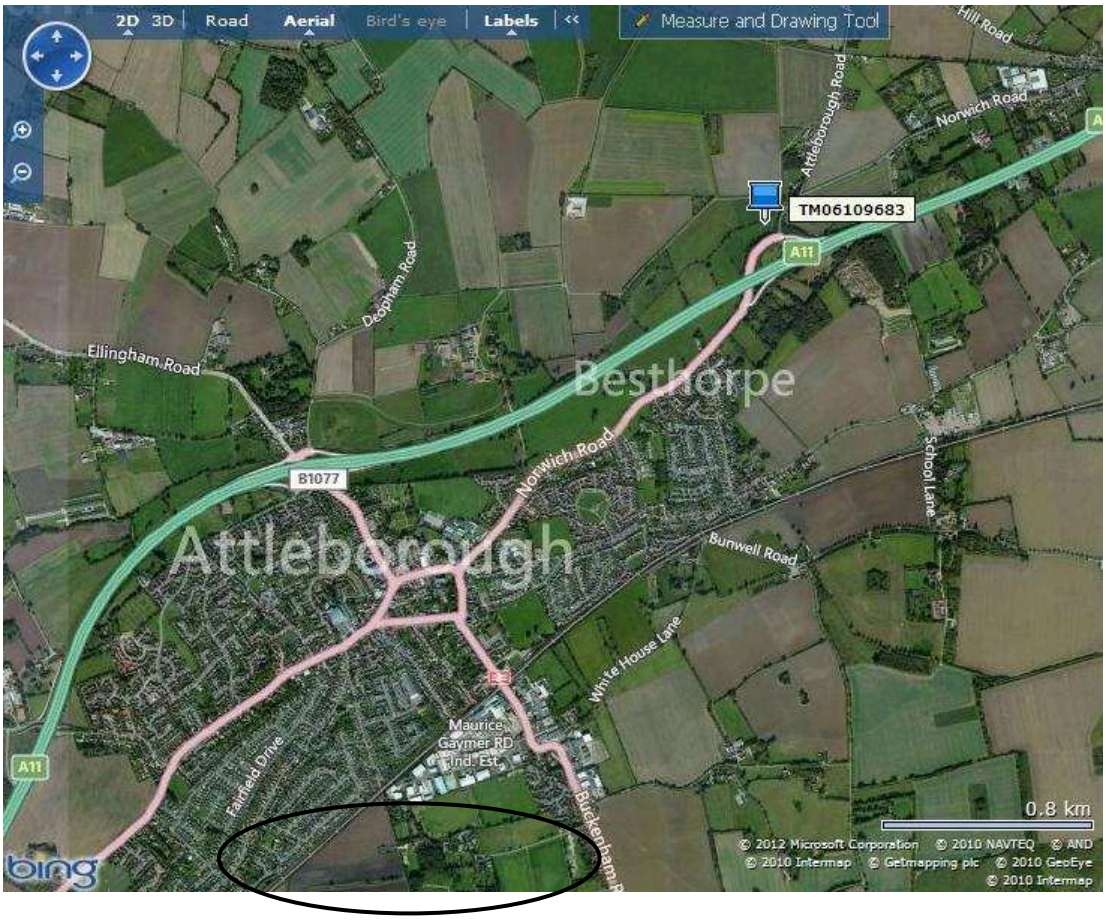
site location

Plate 1: Locations of Bat Records



Site Location

Plate 2 Locations of Otter Records



Site Location

Plate 3 Location of Water Vole Records

UK Protected Species (WCA 1981 (as amended), Sections 1, 5 & 8)

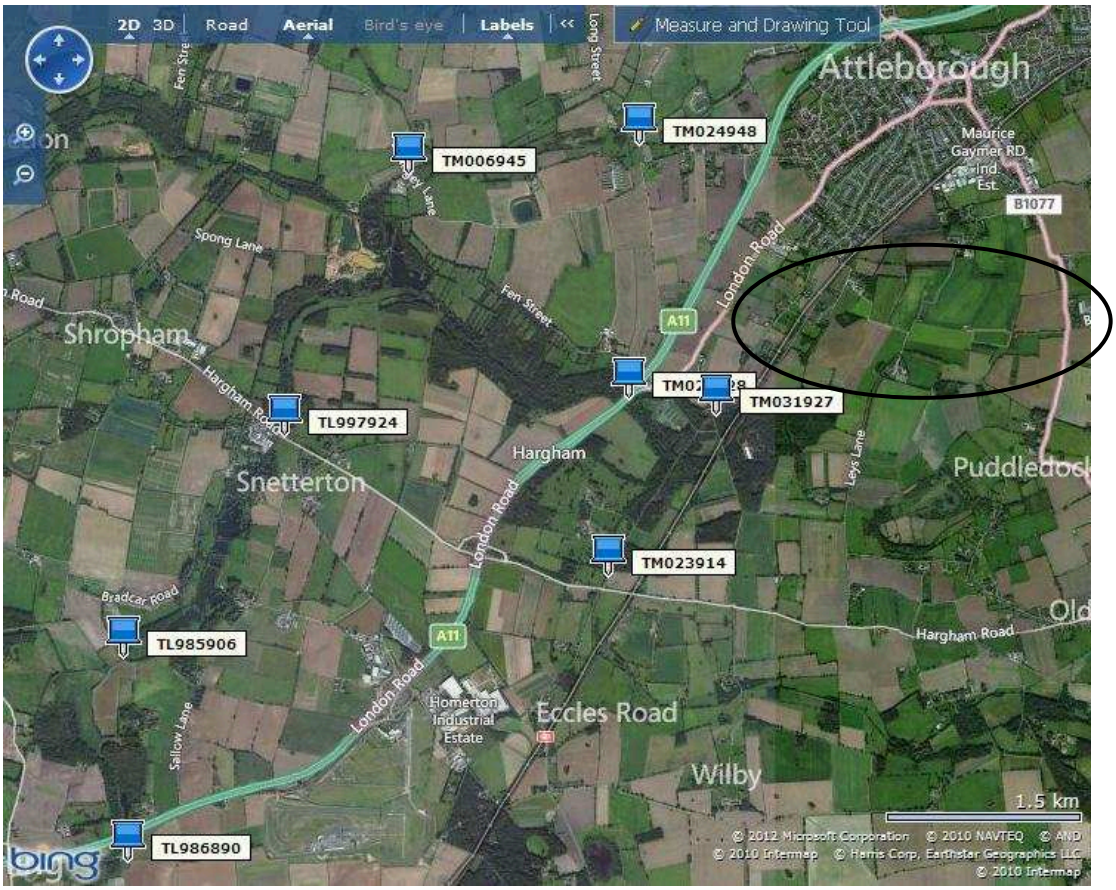
Mammals
Water vole (*Arvicola terrestris*)

Reptiles
There are historic records of common lizard (*Lacerta vivipara*) occurring within 3km of Attleborough. It is considered that this species could still be present in the area.

Amphibians

- Common frog (*Rana temporaria*)
- Common toad (*Bufo bufo*)

Invertebrates
White-clawed crayfish (*Austropotamobius pallipes*)



- site location

Plate 4 Locations of White Clawed Crayfish Records

Other: UK BAP species

Mammals recorded locally include brown hare (*Lepus europaeus*) and West European hedgehog (*Erinaceus europaeus*).

Several records of UK BAP birds, fish and invertebrates were identified during the desk study. A list of these species is provided in Appendix B.

15.4 DISCUSSION

15.4.1 STATUTORY DESIGNATIONS

It is considered that no statutory designated sites will be affected as a result of works due to their distance away from proposed works site.

15.4.2 NON-STATUTORY SITES

Several non-statutory sites (County Wildlife Sites) are located to the north and south-west of the development site. Impacts to these non-statutory sites may arise from the development; however this will depend on final design and the route of development.

15.4.3 *HABITATS*

Habitats that may be affected by works include arable land, improved grassland, hedgerows and buildings. Further survey work would be necessary to determine what degree of impact proposed works would have on each habitat type or ecological feature.

15.4.4 *SPECIES*

Relevant legislation for protected species mentioned can be found in Appendix A.

European Protected Species

Bats

The barbastelle records obtained from the data search are positioned between two SACs that are designated for presence of barbastelles. These are Paston Great Barn SAC, located on the north Norfolk coast (54.94km from desk study records), and Eversden and Wimpole Woods SAC, located in Cambridgeshire (76.60km from desk study records). Barbastelles can fly up to 60km from their roosts to forage. Although unlikely, it is possible that individuals from both SACs frequent the barbastelle roost within 3km of Attleborough, so flight lines to and from these barbastelle SACs could be important. Any other potential bat roosting locations within the area of proposed works should also be surveyed, as they may provide resting places for various species of bats.

Great Crested Newt

Several records of this species are located within the wider landscape around the site. The closest of these records lies approximately 7km to the south-west of the proposed site. It is unclear without further site investigation whether there is just a lack of records for this species closer to Attleborough, or whether the land is unsuitable for this species in this area and therefore no records are present. Satellite maps suggest the latter, but presence of this species cannot be entirely ruled out.

Pool Frog

This species was reintroduced to Breckland between 2005 and 2008, and records show it is present approximately 15km away from Attleborough (near to Thetford). It is unknown whether this species has extended its range towards Attleborough, but considering topography and land use it is considered unlikely that this species will be present within the proposed development site.

UK Protected Species (WCA 1981 (as amended), Sections 1, 5 & 8)

Otter

It can be assumed that otters are present in the area as a result of desk study data. Appropriate mitigation will be required for development.

Water Vole

It can be assumed that water vole have the potential to be present in this area. Location of records show they are unlikely to be directly affected by works, but again a site visit is required to fully scope out this species as suitable water courses could be present adjacent to the site. In addition, appropriate mitigation will need to be in place to deal with potential spillages, etc if working adjacent to any water courses.

Reptiles

There are historic records of common lizard being present near the proposed development area. Potential habitat should be assessed and if necessary reptile surveys carried out to determine areas where reptiles are likely to be present.

White-Clawed Crayfish

It can be assumed from desk study data that this species is present near the site. Appropriate mitigation will need to be designed and adhered to in relation to this species, especially if working near to water courses.

Invasive Species

No invasive species records were present in the desk study data obtained, but invasive species mapping should be undertaken as part of a recommended Phase 1 habitat survey.

15.5 Conclusion

Further survey work and design development is required before a conclusion can be drawn with regards to how proposed works will impact on the ecology of this area.

15.6 Recommendations

15.6.1 Phase 1 Habitat Survey

A Phase 1 habitat survey should be carried out along the proposed route(s) of the scheme. This will also aid in identifying the potential for any protected species that may occur within the area.

15.6.2 Invasive Species Mapping

This can be done as part of the Phase 1 habitat survey. Species including Japanese knotweed (*Fallopia japonica*) and Himalayan balsam (*Impatiens glandulifera*) should be mapped if there is any present within proposed routes or development areas.

15.6.3 Bat Surveys

Bat activity surveys and if necessary bat roost surveys should be undertaken to provide data of bat usage of the proposed development location. This is of particular importance with regards to barbastelle bats as they are known to be wide ranging and therefore may be using areas near to this site or follow flight paths through it. It will be important that works do not impact on the features that are primary reasons for the designation of two barbastelle bat SACs in Norfolk and Cambridgeshire.

15.6.4 *Breeding / Overwintering Birds*

Birds should be taken into consideration if the proposed routes will disturb areas where birds could be breeding or where some species may use as overwinter feeding grounds, such as in arable fields. If this is the case, a breeding and / or overwintering bird survey may be required to evaluate potential impacts on bird species.

15.6.5 *Reptile and Amphibian Habitat Mapping*

As part of the Phase 1 survey, potential reptile and amphibian habitat should be documented. If necessary, reptile and / or amphibian surveys and / or further study may be required if suitable habitat is found during preliminary investigations. Potential for amphibian species that would be of particular significance would be great crested newt. As pool frogs are unlikely to be present within the proposed development site, it is considered unlikely that they will be impacted by the development.

15.7 References

Design Manual for Roads and Bridges (DMRB). Department for Transport, Highways Agency.

NBN Gateway http://data.nbn.org.uk/ (accessed December 2012).

The Conservation of Habitats and Species Regulations 2010 (as amended).

Wildlife and Countryside Act 1981 (as amended).

15.8 Legislation

15.8.1 *European Protected Species*

European Protected Species are those species which are listed on Schedule 2 of the Conservation of Habitats and Species (Amendment) Regulations 2011. The list includes all species of British bats, otter (*Lutra lutra*), great crested newt (*Triturus cristatus*), sand lizard (*Lacerta agilis*), pool frog (*Rana lessonae*) and natterjack toad (*Bufo calamita*).

In addition to this protection, each of these species is also fully protected under the Wildlife and Countryside Act 1981 (as amended). The species listed on Schedule 2 are protected under section 41 of the Regulations, and are afforded protection against:

a) deliberate capture, injury or killing

b) deliberate disturbance

c) deliberate taking or destruction of the eggs

d) damage or destruction of a breeding site or resting place of such an animal

Where a European Protected Species is present, a licence, issued by the Welsh Assembly Government, may be required for development works.

15.8.2 *UK PROTECTED SPECIES - MAMMALS*

Some British mammals are fully protected under section 9 of the Wildlife and Countryside Act 1981 (as amended) which includes water vole (*Arvicola terrestris*). This species is listed on Schedule 5 of the Act and is protected against:

- 9(1) intentional killing, injuring or taking
- 9(4a) intentional or reckless damage or destruction, or obstruction of access to any structure or place which any wild animal included in Schedule 5 uses for shelter or protection
- 9(4b) disturbance of any such animal while it is occupying a structure or place which it uses for that purpose.
- 9(5) sell, offer or exposes for sale, or has in his possession or transports for the purpose of sale, any live or dead wild animal included in schedule 5, or any part of, or anything derived from such an animal

In addition, some British mammals such as bats (all British species), and otter (*Lutra lutra*) are fully protected under the Wildlife and Countryside Act 1981 (as amended), but are also European Protected Species (see above).

15.8.3 *UK PROTECTED SPECIES - BIRDS*

All naturally occurring bird species in Britain are protected under the Wildlife & Countryside Act 1981 (as amended). The legislation protects all birds, their nests and eggs and it is an offence to:

- intentionally kill, injure and take any wild bird;
- intentionally take, damage or destroy the nest of any wild bird while it is in use or being built;
- and intentionally take or destroy the egg of any wild bird.

In addition, any bird listed on Schedule 1 of the above legislation, such as barn owl, is afforded further protection and it is an offence to:

- intentionally or recklessly disturb the bird while nest building or while at (or near) a nest with eggs or young; or
- disturb the dependent young of such a bird.

Some birds are exempt from this protection for certain purposes.

15.8.4 *UK PROTECTED SPECIES - REPTILES*

The four most commonly encountered reptiles, namely common lizard (*Lacerta [Zootoca] vivipara*), slow worm (*Anguis fragilis*), adder (*Vipera berus*) and grass snake (*Natrix natrix*) are partially protected under the Wildlife and Countryside Act 1981 (as amended). Sections 9(1) and 9(5) afford protection against killing, injury and sale only.

Other UK reptiles including sand lizard (*Lacerta agilis*) and smooth snake (*Coronella austriaca*) are fully protected under the Wildlife and Countryside Act 1981 (as amended) and are also European Protected Species (see above). Full protection under the Wildlife and Countryside Act affords these species protection against:

- 9(1) intentional killing, injuring or taking
- 9(4a) intentional or reckless damage or destruction, or obstruction of access to any structure or place which any wild animal included in Schedule 5 uses for shelter or protection
- 9(4b) disturbance of any such animal while it is occupying a structure or place which it uses for that purpose.
- 9(5) sell, offer or exposes for sale, or has in his possession or transports for the purpose of sale, any live or dead wild animal included in schedule 5, or any part of, or anything derived from such an animal

Reptiles are vulnerable to killing and injury during ground disturbance operations and are particularly so during the winter (October to March inclusive) when they are in hibernation. National Guidance (Reptiles: Guidelines for Developers, English Nature 2004) states that "where it is predictable that reptiles are likely to be killed or injured by activities such as site clearance, this could legally constitute intentional killing or injuring". Therefore, in areas where reptiles are present during the active season (April to September inclusive), site clearance should be carried out under ecological guidance. Where reptiles could be hibernating, site clearance during the winter months must be avoided.

15.8.5 *UK PROTECTED SPECIES - AMPHIBIANS*

Natterjack toad (*Bufo calamita*), pool frog (*Rana lessonae*) and great crested newt (*Triturus cristatus*) are protected both as European Protected Species (see above) and also fully protected UK species under the Wildlife and Countryside Act 1981 (as amended). This affords these species protection against:

- 9(1) intentional killing, injuring or taking
- 9(4a) intentional or reckless damage or destruction, or obstruction of access to any structure or place which any wild animal included in Schedule 5 uses for shelter or protection
- 9(4b) disturbance of any such animal while it is occupying a structure or place which it uses for that purpose.

- 9(5) sell, offer or exposes for sale, or has in his possession or transports for the purpose of sale, any live or dead wild animal included in schedule 5, or any part of, or anything derived from such an animal

Other UK amphibians - common toad (*Bufo bufo*), common frog (*Rana temporaria*), palmate newt (*Lissotriton helveticus* (formerly *Triturus helveticus*)) and smooth newt (*Lissotriton vulgaris* (formerly *Triturus vulgaris*)) are partially protected under the Wildlife and Countryside Act 1981 (as amended) and protected under section 9(5) which affords them protection against sale only.

15.9 UK BAP Species Recorded

15.9.1 Other: UK BAP species

Mammals

- Brown hare (*Lepus europaeus*)
- West European hedgehog (*Erinaceus europaeus*)
- **Birds**
- Common bullfinch (*Pyrrhula pyrrhula*)
- Common cuckoo (*Cuculus canorus*)
- Dunnock (*Prunella modularis*)
- Eurasian tree sparrow (*Passer montanus*)
- European turtle dove (*Streptopelia turtur*)
- Great bittern (*Botaurus stellaris*)
- Grey partridge (*Perdix perdix*)
- Hawfinch (*Coccothraustes coccothraustes*)
- Lesser spotted woodpecker (*Dendrocopos minor*)
- Linnet (*Carduelis cannabina*)
- Marsh tit (*Poecile palustris*)
- Northern lapwing (*Vanellus vanellus*)
- Reed bunting (*Emberiza schoeniclus*)
- Ring ouzel (*Turdus torquatus*)
- Skylark (*Alauda arvensis*)
- Spotted flycatcher (*Muscicapa striata*)

- Tundra swan (*Cygnus columbianus*)
- Willow tit (*Poecile montanus*)
- Wood lark (*Lullula arborea*)
- Yellowhammer (*Emberiza citrinella*)

Fish

- European eel (*Anguilla anguilla*)
- Spined loach (*Cobitis taenia*)

Intervebrates

- Blood-vein (*Timandra comae*)
- Brindled beauty (*Lycia hirtaria*)
- Broom moth (*Melanchra pisi*)
- Brown-spot pinion (*Agrochola litura*)
- Buff ermine (*Spilosoma luteum*)
- Centre-barred sallow (*Atethmia centrago*)
- Cinnabar (*Tyria jacobaeae*)
- Dark brocade (*Blepharita adusta*)
- Dark-barred twin-spot carpet (*Xanthorhoe ferrugata*)
- Dot moth (*Melanchra persicariae*)
- Double dart (*Graphiphora augur*)
- Dusky brocade (*Apamea remissa*)
- Dusky thorn (*Ennomos fuscantaria*)
- Garden tiger (*Arctia caja*)
- Green-brindled crescent (*Allophyes oxyacanthae*)
- Grey dagger (*Acronicta psi*)
- Knot grass (*Acronicta rumicis*)
- Lackey (*Malacosoma neustria*)

- Large nutmeg (*Apamea anceps*)
- Large wainscot (*Rhizedra lutosa*)
- Latticed heath (*Chiasmia clathrata*)
- Minor shoulder-knot (*Brachylomia viminalis*)
- Mottled rustic (*Caradrina morpheus*)
- Mouse moth (*Amphipyra tragopoginis*)
- Oak hook-tip (*Drepana binaria*)
- Pale eggar (*Trichiura crataegi*)
- Powdered quaker (*Orthosia gracilis*)
- Rosy rustic (*Hydraecia micacea*)
- Rustic (*Hoplodrina blanda*)
- Sallow (*Xanthia icteritia*)
- Shaded broad-bar (*Scotopteryx chenopodiata*)
- Shoulder-striped wainscot (*Mythimna comma*)
- Small square-spot (*Diarsia rubi*)
- Spinach (*Eulithis mellinata*)
- V-moth (*Macaria wauaria*)
- Wall (*Lasiommata megera*)
- White ermine (*Spilosoma lubricipeda*)
- White-line dart (*Euxoa tritici*)
- White-pinion spotted (*Lomographa bimaculata*)

Other: Bird population status: red

- Song thrush (*Turdus philomelos*)

16. Landscape and Visual Assessment

16.1 The Study Area

The study area adopted for the purposes of this assessment has been informed by both field and desk study and is indicated on Figure 16.1. Figure 16.1 also illustrates representative viewpoints adopted for the purposes of this assessment and Figures 16.2 and 16.3 provide photographs of the existing views from these.

The landform within the study area is gently sloping throughout with low points located within the upper reaches of the Thet Valley. More elevated areas rise to the east around Burgh Common and Besthorpe and beyond. Overall, the impression is of a flat site, with strong visual enclosure provided by woodland blocks, shelter belts and hedgerow trees. The visual envelope is limited in extent due to the vegetation and landform and the study area adopted reflects this. It extends between the A11 Trunk Road to the west, Old Buckenham to the south, Burgh Common to the east and the southern edge of Attleborough to the north. In proximity to Attleborough, the landscape has the appearance of urban fringe farmland with rail and road corridors extending generally north to south. Commercial business areas extend principally along the B1077 Buckenham Road corridor. Elsewhere, there are scattered dwellings and farmsteads, together with occasional footpaths.

16.2 Description of Link Road Options

The main characteristics of the proposed Link Road options are shown in sections of this report shown below:

- Option 1 16.5
- Option 2 16.6
- Option 3 16.7

16.3 Methodology

The assessment considers the effect on the landscape resource, both directly though loss of landscape elements, indirectly in terms of subtle effects on character and the effect on visual amenity or views.

The assessment of the likely significant effects of the proposed development has taken account of all the attributes of the landscape. The sensitivity of an individual landscape element reflects factors such as its quality, value, contribution to landscape character and the degree to which the particular element can be replaced. Where individual elements are affected, professional judgement has been used as far as possible to give an objective evaluation of its sensitivity, expressed as high medium or low.

Landscape elements likely to be less common or included in lists of priority habitats are likely to have higher sensitivity to change.

Landscape elements and vegetation cover that reflect the existing broad landscape and are typical of the regions agricultural regime are likely to be less sensitive to change.

The magnitude of change on landscape elements is quantifiable and is expressed in terms of the degree to which a landscape element will be removed or altered by the proposed development. These are described in Table 16.1 below.

Magnitude of change	Definition
High	Total or major loss of an existing landscape element.
Medium	Partial loss or alteration to part of an existing landscape element.
Low	Minor loss or alteration to part of an existing landscape element.
Negligible	No loss or very minor alteration to part of an existing landscape element.

Table 16.1 Magnitude of Change on Landscape Elements

Landscape character is a distinctive and recognisable pattern of elements that occurs consistently in a particular type of landscape and the way that this pattern is perceived. Effects arise either through the introduction of new elements that physically alter this pattern of elements or through visibility of the proposed development, which may alter the way in which the pattern of elements is perceived.

Landscape sensitivity is the degree to which a particular area can accommodate change without unacceptable harm to its character. It varies depending on the existing land-use, pattern and scale of the landscape, the degree of openness, scope for mitigation in keeping with the existing landscape character, condition and any designations that may apply. These are described in Table 16.2 below.

Sensitivity	Definition
High	Areas that exhibit a strong positive character. Vulnerable landscape. Often highly visible from adjacent landscapes. Aesthetically attractive landscapes.
Medium	Areas that exhibit a positive character. May have some sense of enclosure or be affected by some man-made features/elements. Limited intervisibility with adjacent landscapes. Reasonable distribution of semi-natural vegetation. Overall view of landscape is pleasant.
Low	Areas that exhibit a negative character. Robust landscape. Strong sense of enclosure that reduces visual sensitivity. Already affected by man-made features, such as pylons, industrial dereliction or built forms. Reduced tranquillity. Lack of mature vegetation. No designations apply.

Table 16.2 Landscape Sensitivity

The magnitude of change on landscape character is an expression of the scale of the change that will result from the proposed development and is dependent on a number of variables, including:

- The degree to which the pattern of elements making the landscape character will be altered;
- The extent of the receptor that will be affected by the proposed development;

- The distance between the character receptor and the proposed development; and
- The extent of the proposed development that will be seen.

Definitions of magnitude of change in relation to character are outlined in Table 16.3 below.

Magnitude of change	Definition
High	Substantial loss or major alteration to key elements. Fundamental change to character.
Medium	Partial loss or alteration to part of an existing landscape element.
Low	Minor loss or alteration to part of an existing landscape element.
Negligible	No loss or very minor alteration to part of an existing landscape element. No fundamental change to character.

Table 16.3 Magnitude of Change in Relation to Character

The assessment of effects on views has been carried out, at this stage, from a series of representative viewpoints within the study area. These provide an indication of effects on places where people live or participate in recreation. Viewpoint sensitivity is outlined in Table 16.4 below.

Sensitivity	Definition
High	Receptors whose view is focussed on the landscape or views surrounding them. Prolonged viewing opportunity. Residential buildings, scenic drives, users of recreational routes, important landscape features with physical, cultural or historic attributes.
Medium	Receptors with a moderate interest in the landscape or views surrounding them. Secondary viewing opportunity from residential buildings, scenic drives, users of recreational routes, important landscape features with physical, cultural or historic attributes.
Low	Receptors whose focus is on their work or activity or who have only a passing or momentary interest in their surroundings or travelling on roads and motorways.

Table 16.4 Viewpoint Sensitivity

Definitions of magnitude of change on visual receptors are outlined in Table 16.5 below.

Magnitude of change	Definition
High	Major change in the view that has a defining influence on the overall view/many visual receptors affected.
Medium	Some change in the view that is clearly visible and forms an important but not defining element in the view.
Low	Some change in the view that is not prominent/few visual receptors affected.
Negligible	No notable change in the view.

Table 16.5 Magnitude of Change on Visual Receptors

The significances of effects are an expression of the sum of magnitude and sensitivity evaluations and are outlined in Table 16.6 below.

		Magnitude of change			
		High	Medium	Low	Negligible
Sensitivity	High	Major	Major/moderate	Moderate/Minor	Minor/moderate
	Medium	Major/moderate	Moderate	Minor/moderate	Minor
	Low	Moderate/Minor	Minor/moderate	Minor	Negligible/none

Table 16.6 Significance of Effects

Effects evaluated as major/moderate and above are potentially significant to significant.

16.4 Baseline Landscape Conditions

16.4.1 Landscape Designations/Policy

Landscape designations are covered by the policy and planning section of the report. Of relevance are the following:

- The Attleborough Conservation Area. Site investigations have established that there will be no visibility of the proposed road options from this area;
- The Old Buckenham Conservation Area. Site investigations have established that there will be no visibility of the proposed road options from this area;
- Listed Buildings at Besthorpe and Burgh Common. Site investigations have established that there will be no visibility of the proposed road options from these buildings;
- Burgh Common is a county wildlife site;
- Old Buckenham Fen/Willow Farm designated as an SSSI;

- Bunn's Bank Scheduled Ancient Monument is a bank and ditch that runs along the Old Buckenham Parish Boundary for about 2.5km. It is a linear earthwork dating from approximately the 12th century onwards and it is suggested that it was a park boundary for Buckenham Deer Park.

16.4.2 Other Development Proposals/Planned Development

Breckland Council plans to allocate existing agricultural land around Attleborough for development. Proposed sites have been promoted to the council for inclusion, including areas to the south of the railway, where a possible 4000 houses may be built.

16.4.3 Topography

The topography of the area is gentle, with the study area located around the shallow upper reaches of the Thet Valley, flowing generally towards the southwest. The land rises from low points of around 28 metres AOD in the west to high points of around 52 metres AOD at Burgh Common.

16.4.4 Vegetation Pattern

The majority of the study area comprises arable farmland divided by hedges with trees and occasional shelter belts of poplar and willow trees. To the south, native and plantation woodland blocks and Fen (wet) woodland and scrub is located at Hargham Heath and at Old Buckenham Fen (SSSI). Areas to the west of the railway are smaller in scale and contain scattered dwellings, many of which have associated areas of garden vegetation and woodland. This gives the landscape a well treed appearance in contrast to the more open areas to the east.

16.4.5 Settlement Pattern

The market town of Attleborough historically developed on the route of the original A11. The older sections of the settlement have a linear form with more recent 1960's residential and commercial development supplementing this along the edges and following the B1077 to the south-east.

16.4.6 *LANDSCAPE CHARACTER*

The *'Breckland District Landscape Character Assessment – Volume 1' (Produced for Breckland District council by Land Use Consultants 2007)* extends across the study area and considers the rural landscape. Volume 2 provides a more detailed assessment of the fringe areas around twelve key settlements, including Attleborough. The following character areas extracted from these documents are relevant to this commission:

Area A2 River Valleys – River Thet: This area comprises a broad shallow valley, carved into the solid chalk geology by glacial meltwaters. Often overlying this are deposits of sand and gravel, which have historically been the subject of mineral extraction. Redundant workings are usually flooded and are a distinctive element in the landscape. Elsewhere, overlying peat deposits result in Fen and Alder Carr habitat. The area drains to the south-west and possesses an enclosed character, with occasional views framed by small blocks of wet woodland and localised blocks of mixed plantation woodland. Views to churches are also a noted characteristic. Field pattern is small scale and irregular, with pastoral/rough grazed field boundaries formed by ditches and willow/alder belts and post and wire fencing. Settlements are sparse, with hamlets at bridging points and scattered farmsteads. This is a small scale, varied landscape, tranquil and rural with a network of narrow rural lanes and small scale river crossings. The river follows a natural meandering course, with riparian vegetation along the valley floor. Detractors within this landscape include the A11 corridor and areas of afforestation. Other changes or trends evident in the landscape include mineral extraction, loss of parklands, colonisation with wet woodland, road widening and pressure for housing development.

Area A2 extends into the Study Area from the west and extends south and north to the edge of Attleborough.

The sensitivity of the landscape to the type of development proposed is **high.**

Area B2 Settled Tributary Farmland – The Buckenham's Tributary Farmland: This area comprises undulating arable farmland forming a transition between river valley and plateau landscapes. This is a rural, tranquil landscape with medium scale, variable fields. Boundaries are relatively strong, with remnant hedges and trees common. The area is generally enclosed and contained by landform ranging between 20 and 50m AOD. Mixed woodland and shelter belts are evident throughout the area and in places provide the skyline. Whilst the southern edge of Attleborough dominates to the north, elsewhere settlements are often historic, displaying a range of vernacular materials and nucleated in form, with village greens forming a central feature. Scattered farmsteads are evident elsewhere. Detractors include the urban edge of Attleborough and the A11.

Area B2 extends from the north-west to the south-east across the centre of the Study Area.

The sensitivity of the landscape to the type of development proposed is **medium.**

Area D3 The Brecks – Heathland with Plantation – Hargham Heath: This area comprises open arable farmland, heathland and forestry plantation blocks. Fields are medium to large scale, geometric in shape and the area feels open and remote. The landscape feels windswept, due in part to the extent of hedgerow loss that has occurred and occasionally through the wind-sculpted forms of Scots Pine shelterbelts. The appearance is of a flat landscape, although some tributary streams result in gentle undulations. Settlement pattern is dispersed, with occasional nucleated hamlets connected by narrow unmarked rural lanes. Although occasional vistas exist, particularly where remnant parkland survives, tree cover tends to restrict views. Detractors include A11 trunk road and possibly the railway line.

Area D3 extends across the south of the Study Area.

The sensitivity of the landscape to the type of development proposed is **medium.**

Area E3 Plateau Farmland – Old Buckenham Plateau: This area comprises predominantly arable farmland with simple, regular, geometric fields. Field boundaries are well treed, with managed hedges and occasional woods. However, the elevated landform and open, exposed, large scale of the landscape often allows long distance, panoramic views into the River Thet Valley *(Area A2 River Valleys – River Thet)* to the west and elsewhere. The area has a tamed, unified character and is well-settled, with farmsteads, hamlets and small villages. Occasional marl pits and plantation blocks interrupt the rural landscape although overall, the area is rural, tranquil and unspoilt. A number of notable historic halls and estates are located within this area, such as Old hall or Besthorpe Hall. Within the Study area Bunn's Bank is a Scheduled Ancient Monument.

Area E3 extends across the more elevated land to the east of the Study Area.

The sensitivity of the landscape to the type of development proposed is **medium.**

16.5 Visual Appraisal of Options

Sixteen viewpoints (VP) have been provided to illustrate visual effects, supported by panoramic photographs. The positions of these are indicated on Figure 16.1 and illustrated on Figures 16.2 and 16.3. Descriptions are provided in Table 16.7 below.

The landscape within the study area is unremarkable and in the main comprises arable farmland with trees and hedgerows defining the boundaries. Shelter belts of poplar and willow are common and form visual markers. The landform undulates gently throughout although the general impression is of flat, open landscape with wide open skies. Some subtle variations are notable to the:

- To the west, generally between the A11 Trunk Road and the Cambridge to Norwich Railway. Fields in this area are small in scale and enclosure from tree cover is more pronounced, both along field boundaries and associated with the scattering of detached dwellings. Views are therefore short range with the extents defined by vegetation. Detractors typically include telegraph poles, traffic and associated infrastructure along the B1077 and A11 roads, buildings and inappropriate boundary treatments. Sensitive receptors will include residents and users of footpaths. Viewpoints 8 to 12 and 14 to 16 illustrate views from this area;

- To the south. Extensive areas of woodland at Hargham Heath and extending across to Buckenham Fen provide enclosure. There are few detractors visible and the landscape is tranquil, peaceful and remote throughout. Sensitive receptors will include users of footpaths/promoted routes, including the TAS Valley Long Distance Route and residents. Viewpoints 4 and 13 illustrate views from this area;

- To the east, between the railway and the B1077 Attleborough Road. Fields are large and tree cover less pronounced than areas to the west. The scale of the landscape is larger and medium range views are available from the B1077 Attleborough Road and housing areas looking west. Detractors include buildings, inappropriate boundary treatments and traffic/infrastructure along the B1077. Viewpoints 1, 2 and 5 illustrate views from this area;

- To the north, broadly around 500m to 1km from the urban edge of Attleborough. This area has the appearance of urban fringe and contains varied land uses, such as commercial/business, derelict land and housing areas. Other detractors include telegraph poles, traffic, railway and boundary treatments. The landscape in this area has a varied scale and is active and disturbed throughout. Viewpoints 6, 7, 9 and 12 illustrate views from this area.

VP No.	Viewpoint Name	OSGR	Approximate Distance to Option			Description of existing view, and sensitivity
			1	2	3	
1	B1077 Foundry Corner	056941	0	336	560	Represents views west from residential properties and from travellers using B1077 road. Open medium range panoramic view glimpsed through hedgerow across gently rolling arable farmland. Housing will have rear second floor filtered views where tree planting allows. Simple landscape comprising large fields divided by hedges with trees and some shelterbelts. No significant detractors are visible. Views from road are **low** sensitivity. Views from houses are **high** sensitivity.
2	B1077 Bunn's Bank	058935	545	260	0	Represents views west from travellers using B1077 road, as well as users of Public Footpath FP4. Also representative of setting of Scheduled Ancient Monument Bunn's Bank. A residential property is also located to the north, although this is well screened by tree and hedge planting. Open medium to distant range view glimpsed through a break in the roadside hedgerow. Landscape visible comprises gently undulating arable farmland with some enclosing poplar and willow shelterbelts and occasional mature trees/woodland blocks. Detractors include the B1077 Attleborough Road in the foreground and an agricultural building in the middle distance. Views from road are **low** sensitivity. Views from footpath are **high** sensitivity.
3	Fen Street, Puddledock	055924	1500	1215	1065	Represents views north-west from residential properties and Fen street along the northern edge of the village. Glimpsed short range views across small scale flat farmland are available with much enclosure from mixed tree, woodland and shelterbelt planting and hedges. The area is visually enclosed and diverse with farm buildings and occasional houses interrupting the rural panorama. Views from road are **low** sensitivity. Views from footpath are **high** sensitivity.
4	Leys Lane/Old Buckenham Fen	042917	1890	1575	1250	Represents views north from Leys Lane, intersecting minor road, residential property and TAS Valley Long distance footpath. Open panoramic views north are available across gently undulating arable fields. Mixed shelterbelts, woodland, hedges and occasional trees add some interest and enclosure to this large scale open landscape. Old Buckenham Fen, a dense block of native wet woodland and scrub (SSSI) is located to the east and frames views to the north. The area feels tranquil and there are few detractors visible. Views from road are **low** sensitivity. Views from promoted long distance footpath are **high** sensitivity.

VP No.	Viewpoint Name	OSGR	Approximate Distance to Option			Description of existing view, and sensitivity
			1	2	3	
						Views from the Residential property are **high** sensitivity.
5	Footpath, Fowlers Lane.	044935	107	75	500	Represents views from east to west from public footpath along Fowlers Lane. Open panoramic views are available across arable gently undulating large scale farmland. To the south and southwest, the shallow upper reaches of the Thet Valley are distinguishable. Enclosure is provided by woodland blocks and willow/poplar shelterbelts and occasional hedges. Detractors include telegraph poles and glimpses of buildings to the west. Views from Public Footpath are **high** sensitivity.
6	Slough Lane, Attleborough	054945	439	760	930	Represents views south from a minor road and adjacent residential properties located along the western edge of Buckenham Road (B1077). This includes a number of houses under construction. Open short range panoramic views are available across arable farmland rising to a ridgeline around 0.6km to the south. Enclosure is provided by hedges with mature tree planting and occasional copses or shelter belts. Detractors include telegraph poles scattered buildings, and new housing site to the east. Views from road are **low** sensitivity. Views from the residential property are **high** sensitivity
7	Leys Lane, Attleborough	051942	235	430	740	Represents views south-east from minor road, housing and commercial properties along the southern edge of Attleborough. Glimpse and filtered views south-east are available across arable farmland with enclosure provided from well treed hedgerows. Landscape rises gently to a ridgeline. Detractors include telegraph poles, farm buildings and inappropriate urban edges. Views from road are **low** sensitivity. Views from the residential property are **high** sensitivity.
8	B1077 London Road/Public footpath BR5	032936	175	0	460	Represents views east from London Road B1077 and intersection with Public Footpath BR5. Also representative of adjacent residential property. Filtered views east are available through gaps and over the top of the roadside hedge. The landscape is gently undulating with the upper reaches of the Thet Valley perceptible. Some scattered dwellings and agricultural dwellings are visible, although the landscape is well treed and this filters visibility to an extent. Detractors include telegraph poles, traffic on the B1077 London Road and A11 Trunk Road and farm buildings. Garden vegetation around the adjacent detached property and next to the footpath screen views to an extent. Views from road are **low** sensitivity. Views from the residential property and Public Footpath are **high** sensitivity.

VP No.	Viewpoint Name	OSGR	Approximate Distance to Option			Description of existing view, and sensitivity
			1	2	3	
9	Fowlers Lane, Attleborough	038940	270	615	1100	Represents views south from minor road and housing along the southern edge of Attleborough and west of the railway line. Open panoramic views south are available across arable farmland. The landscape slopes gently into the upper reaches of the Thet Valley. Scattered dwellings and properties along the southern edge of Attleborough are visible and the landscape feels like an urban fringe area. However, the landscape is well treed and this filters visibility to an extent. Detractors include the railway, telegraph poles, farm buildings and inappropriate urban boundaries to properties. Views from road are **low** sensitivity. Views from the residential properties and Public Footpath are **high** sensitivity.
10	Poplar Road , Attleborough	037935	210	100	445	Represents views south from minor road at Poplar Road/Fowlers Lane and adjacent residential properties. Glimpse views are available between foreground tree planting across a small pastoral field. Woodland in the middle range screens any visibility further south and the landscape is enclosed and small in scale. Scattered dwellings along Fowlers Lane and Poplar Road are visible although garden vegetation filters and screens some views. Detractors include residential buildings, telegraph poles and inappropriate urban boundaries to properties. Views from road are **low** sensitivity. Views from the residential properties and Public Footpath are **high** sensitivity.
11	Poplar Road , Attleborough	040936	0	305	615	Represents views east and west from minor road at Poplar Road/Fowlers Lane and adjacent residential properties. Open panoramic views are available across arable farmland, with some interruption by intervening garden vegetation, residential buildings and gappy hedges. Small blocks of woodland, hedgerow trees and shelter belts give the landscape a well treed appearance. Scattered dwellings along Fowlers Lane/ Poplar Road and Hargham Road are visible although garden vegetation filters and screens some views. Detractors include residential buildings, farm buildings telegraph poles and inappropriate urban boundaries to properties. Views from road are **low** sensitivity. Views from the residential properties and Public Footpath are **high** sensitivity.
12	Poplar Road , Attleborough	041939	260	620	1030	Represents views south from minor road at Poplar Road/Fowlers Lane and adjacent residential properties. Open panoramic views are available across arable farmland, with some interruption by intervening garden vegetation, residential and agricultural buildings and property boundaries. Small blocks of woodland, hedgerow

VP No.	Viewpoint Name	OSGR	Approximate Distance to Option			Description of existing view, and sensitivity
			1	2	3	
						trees and shelter belts give the landscape a well treed appearance. Scattered dwellings along Fowlers Lane/ Poplar Road and Hargham Road are visible although garden vegetation filters and screens some views. Detractors include residential buildings, farm buildings telegraph poles, railway and inappropriate urban boundaries. Views from road are **low** sensitivity. Views from the residential properties and Public Footpath are **high** sensitivity.
13	Detached property, Hargham Road	030927	1060	845	390	Represents views north from residential property and minor road. Views north may be available from this detached property, extending north across sloping arable farmland to a ridgeline around 500m from the property. Views in other directions are screened/enclosed by woodland planting. There are no views from Hargham Road due to enclosing vegetation. Views from the residential property are **high** sensitivity.
14	Portmere Farm, Hargham Road	034932	660	335	120	Represents views east and west from residential property and minor road. Portmere Farm is also a Listed Building. Short range views from road extend across gently undulating arable farmland with strong enclosure from woodland at Hargham Heath and hedgerow trees elsewhere. Land rises to the ridgeline around 400m to the west. Detractors include telegraph poles and intermittent effects from the railway. Portmere Farm is heavily enclosed/screened by woodland. Views from road are **low** sensitivity. Views from the residential property are **high** sensitivity.
15	Haverscroft Farm/Fowlers Lane/Hargham Road	036935	220	90	570	Represents views south from residential properties, minor road and footpath. Filtered and glimpsed short range views are available through mixed tree and hedgerow planting across a small scale flat or gently undulating pastoral rural landscape. Detractors include the railway (intermittent), telegraph poles, occasional road signs and residential buildings/boundaries. Views from road are **low** sensitivity. Views from the footpath are **high** sensitivity. Views from the residential property are **high** sensitivity.
16	Haverscroft House, Hargham road	037936	15	290	730	Represents views from residential properties and minor road. Open middle range panoramic views are available across arable farmland sloping gently west to the ridgeline around 500m from the viewpoint. The landscape is open and medium to large in scale with some enclosure

VP No.	Viewpoint Name	OSGR	Approximate Distance to Option			Description of existing view, and sensitivity
			1	2	3	
						from hedgerow tree planting. Detractors include telegraph poles, buildings and carriageway. Views from residential properties are variable depending on boundary treatments and planting. Views from road are **low** sensitivity. Views from residential properties are **high** sensitivity.

Table 16.7 Visual Appraisal of Link Road Options

16.5.1 *Value of Environmental Resources/Receptors*

A number of elements will be vulnerable to change and, therefore, sensitive to landscape and visual impacts, including the following:

- Residential properties. Housing along the southern edge of Attleborough, along the B1077 Attleborough Road, Hargham Road and B1077 London Road, benefits from open views out over a relatively open and attractive rural landscape;
- Vegetation associated with field boundaries and woodland within the footprint of the proposed development;
- Views from public footpaths. Well used routes include Fowlers Lane/Poplar Road (FP7) extending from Leys Lane to Hargham Road. In addition The TAS Valley Way extends through the south of the study area along minor lanes;
- The setting of Scheduled Ancient Monument Bunn's Bank;
- The rural, tranquil aspects integral to the landscape character across much of the study area.

The Study Area has also attracted a number of landscape designations that suggest greater sensitivity to landscape change, including:

- Conservation Areas within the centre of Attleborough and Old Buckenham. Conservation Area. A historic core which gained CA status in 1975. 16 listed buildings within this area;
- Listed buildings in Attleborough and also at Portmere Farm, Hargham Road;
- Listed buildings at Besthorpe and Burgh Common;
- Old Buckenham Fen/Willow Farm SSSI;
- Bunn's Bank Scheduled Ancient Monument.

16.5.2 *Potential Effects*

Landscape and visual impacts are independent but related issues. Landscape issues relate to changes in the fabric, character and quality of the physical baseline landscape. Visual impacts relate to the changes in appearance and the perception of these changes on people who might see them.

The Landscape and Visual Assessment, therefore, will need to consider the extent to which the road will be visible in the landscape, the character of the landscape and its capacity to accept the changes. It will also need to consider the extent to which impacts can be mitigated and the road integrated into the landscape.

Potential visual effects could be assessed as occurring:

- During construction;
- On a winter's day in the year that the scheme opens to traffic;
- In the winter and summer of year 15 after opening, taking account of proposed planting (but excluding offsite planting). However, at this early stage, it is not possible to assess year 15 effects, as the design is at a preliminary stage. Mitigation planting for example is unknown.

Effects during construction will be short-term and variable in magnitude, comprising the imposition of construction machinery, traffic and operations within a valued rural landscape. A programme for the construction operations will need to be reviewed and consideration given to the various operations required. Mitigation for these effects will, in many cases, be difficult and effects are likely to be significant overall over the period of construction.

Potential effects during operation are outlined below. However, at this stage, these are indicative only and will need to be assessed in detail and taken forward within the Stage 2 and 3 Assessment, with consideration given to the stages outlined above.

16.6 OPTION 1

It is anticipated that this option will have a 'street-like appearance', with a 7.3 metre carriageway width and 3 metre width shared footways/cycleways on both sides. A verge around 0.5 metres in width will separate the footways from the carriageway. The total width is likely to be around 14.3 metres.

The imposition of this route upon the landscape within the study area will result in the following **direct effects:**

- Approximately 710 linear metres of native hedgerow will be within the footprint of the route and will require removal;
- Approximately 1450 m^2 of native woodland or scrub will be within the footprint of the route and will require removal;
- Approximately 2 mature trees will require removal;
- The route is approximately 2650 metres in length and will require three arm roundabouts at each end. An additional length of carriageway may be required to bypass residential properties at Foundry Corner and this is estimated to be around 410 in length. Total land-take of predominantly arable agricultural land required for this option is estimated to be approximately 43,800m^2;
- The route will sever Leys Lane to the north. Junctions will be provided;
- The route will possibly sever Poplar Road, depending on how access is resolved. This is a designated public footpath;

- An embankment approximately 450 metres in length and rising to approximately 6 metres will be needed to facilitate access across the railway line. The footprint for this element is approximately 15,200m^2.

The woodland, trees, hedges and other vegetation within the study area are evaluated as medium sensitivity to change. The direct effect, comprising removal of vegetation within the footprint of the proposed development, will have a medium magnitude of change. This equates to an effect of moderate significance.

Provided that Leys Lane and Poplar Road are well integrated with the development, it is likely that effects on severance will be negligible. The Link Road will be at grade at the crossing with Leys Lane and an underpass may allow Poplar Road to cross it.

Indirect effects on landscape character will include the following:

16.6.1 River Thet Valley (Landscape Character Area A2)

This area has an enclosed character, with occasional views framed by small blocks of wet woodland and localised blocks of mixed plantation woodland. The field pattern is small scale and irregular, with pastoral/rough grazed field boundaries formed by ditches and willow/alder belts. In addition the edge and urban fringe of Attleborough, rail and road corridors intrude and reduce tranquil and rural qualities. Aspects of this character area that will, however, be sensitive to the proposed development will include the following:

- *'Broad shallow valley.'* The eastern embankment rising to elevate the proposed road over the railway is within this area and has the potential to interrupt the flowing, gentle lines of the upper valley landform. However, as displayed by viewpoints 9, 11 and 12, the landform is subtle and trees and hedge planting limits visibility to short and medium range glimpse views;

- *'Small scale, varied landscape, tranquil and rural.'* The scale of the development will be large and linear in form. This will potentially conflict with the intimacy of this landscape. Rural tranquillity will be eroded;

- *'With riparian vegetation.'* Riparian vegetation is not present within the vicinity of option 1 and this aspect is unaffected;

The sensitivity of this area to the development proposed is high. The area affected by Option 1 is limited within the context of the overall character area and around 500 metres of the road will pass through the area at grade beyond the base of the embankment. The magnitude of effect locally is, therefore, low and negligible in relation to the overall character area. The significance of the effect is negligible.

16.7 SETTLED TRIBUTARY FARMLAND (LANDSCAPE CHARACTER AREA B2)

The road will pass at grade through this area for a total of approximately 1500 metres. Rural tranquillity will be eroded although this medium scale landscape is influenced by the southern edge of Attleborough and has fringe qualities. It is also enclosed, undulating in form and is relatively well treed. These aspects reduce visibility and increase the capacity of the landscape to accommodate the development proposed. The sensitivity of the landscape is low. The magnitude of effect locally is also low and negligible in relation to the overall character area. The significance of the effect is negligible.

16.7.1 PLATEAU FARMLAND (LANDSCAPE CHARACTER AREA E3)

This area has well treed field boundaries with hedges and occasional woodland. However, overall the landscape is open and expansive and visibility more widespread. The eastern 500 metres of the Option 1 proposals extend into this area and will cut across the grain of the landscape. Although it will be at grade the traffic and length of the road will be visible. The sensitivity of the landscape is medium. The magnitude of effect locally is also medium and negligible in relation to the overall character area. The significance of the effect is low.

Significant visual effects have been recorded at the following viewpoints, which are indicated on Figure 16/1. The actual viewpoints are shown on Figures 16/2 and 16/3. Although descriptions of effects upon all viewpoints are recorded within Table 16.8, chainages referenced in the table are those that appear on Drawing Number CS/060268/SK01.

- **Viewpoint 1:** Residents in housing at Foundry Corner will receive views from the rear of the houses, filtered by garden vegetation. These will take in the carriageway and footways and associated elements, including traffic. The bypass to the rear of the housing will also be visible, along with traffic, lighting etc.

- **Viewpoint 5:** A section of the alignment from around Chainage 1700 will be clearly visible extending from a relative high point to the north of Leys Cottage, west across arable farmland as far as the railway. The landscape is open and all elements will be visible, including hard surfaces, vehicles and lighting. Some vegetation loss will be visible as the road cuts though field boundaries to the north. The embankment and bridge across the railway is also likely to be visible, although intervening vegetation is likely to partially filter and obscure these views.

- **Viewpoint 9:** Open views south across arable farmland will allow visibility of the embankments and rail crossing and other vertical elements, including traffic. These will be seen at a distance of around 400 metres. The embankments will interrupt the panoramic views south, and their imposition will require removal of mature trees/woodland following the railway alignment. The intrusion of urban elements will also reinforce the urban fringe type character that prevails in this area.

- **Viewpoint 10:** Glimpse views are available between foreground tree planting across a small pastoral field and between residential properties. The woodland forming a backcloth to this area will be removed and replaced with embankments and the rail crossing for the proposed alignment. This will be a dominating element in views south and together with traffic, signage and lighting, will reinforce the urban fringe characteristics already prevalent in this area.

- **Viewpoint 11:** This viewpoint is located on the proposed alignment as it crosses Poplar Road. It is envisaged that an underpass below the embankment may be provided to avoid issues of severance. The embankments, traffic and other vertical elements will have substantial impact on this viewpoint, due to proximity, as well as adjacent properties overlooking the existing rural landscape. To the east the proposed route will be visible as far as around Chainage 1300, after which vegetation and landform will screen any potential views.

- **Viewpoint 12:** The embankments and bridge as well as traffic and lighting will be visible extending across arable farmland between residential properties. The landscape is flat or gently sloping and the proposed structure will be a dominating element in the small scale landscape and will interrupt the open views south.

- **Viewpoint 16:** This viewpoint is located at the intersection of the proposed route with Hargham Road and is representative of two detached properties located adjacent to the route. A junction will be required at this location and it is also likely that some large scale regrading works will be needed to integrate the proposed route, which will be rising to maintain access over the railway, with the lower elevations of Hargham Road. Traffic, lighting, signage and other vertical elements will be visible. The hard surfaces will also be seen extending along the route to the west and rising over the railway on embankments.

Overall, the assessment demonstrates that visual effects will be highly localised, due to the gentle topography and the extent of tree, hedge and other planting. The area along the corridor also contains relatively few sensitive receptors. Those that are affected to a significant degree will include:

- Housing at Foundry Corner. Rear elevation second floor filtered views east are available from approximately 15 properties;

- Housing looking south onto open country side along Poplar Road, along both east and west sides of the railway. Approximately 10 properties will receive ground floor front views;

- Footpath/bridleways along Fowlers Lane/Poplar Road. Varied views will be available depending on vegetation, distance from proposed route etc;

- Detached properties along Hargham Road. Approximately 6 properties will be affected;

- Scattered farmsteads/properties in the wider landscape. Approximately 2 properties will be affected, at Leys Cottage and at Docking Farm.

16.8 OPTION 2

It is anticipated that this option will also have a 'street-like appearance', with a 7.3 metre carriageway width and 3 metre width shared footways/ cycleways on both sides. A verge around 0.5 metres in width will separate the footways from the carriageway. The total width is likely to be approximately 14.3 metres.

- Approximately 912 linear metres of native hedgerow will be within the footprint of the route and will require removal;
- Approximately 6520m^2 of native woodland or scrub will be within the footprint of the route and will require removal;
- The route is approximately 2950 metres in length and will require three arm roundabouts at each end. Total land-take of predominantly arable agricultural land required for this option is estimated to be approximately 42,200m^2;
- The route will sever Leys Lane to the north of Leys Cottages. Replacement junctions will be provided;
- The route will sever Public Footpath FP7 to the north-west of Leys Farm;
- The route will sever Hargham Road to the south of Portmere Farm. Junctions will be provided;
- An embankment approximately 420 metres in length and rising to approximately 6 metres will be needed to facilitate access across the railway line. The footprint for this element is approximately 14,200m^2.

The woodland, trees, hedges and other vegetation within the study area are evaluated as medium sensitivity to change. The direct effect, comprising removal of elements within the footprint of the proposed development, will have a high magnitude of change. This equates to an effect of major/moderate significance.

Provided that Leys Lane, Footpath FP7 and Hargham Road are well integrated with the development, it is likely that effects on severance will be negligible.

Indirect effects on landscape character are outlined below:

16.8.1 *River Thet Valley (Landscape Character Area A2)*

This area has an enclosed character, with occasional views framed by small blocks of wet woodland and localised blocks of mixed plantation woodland. The field pattern is small scale and irregular, with pastoral/rough grazed field boundaries formed by ditches and willow/alder belts. In addition the edge and urban fringe of Attleborough, rail and road corridors intrude and reduce tranquil and rural qualities. Aspects of this character area that will, however, be sensitive to the proposed development will include the following:

- *'Broad shallow valley.'* The embankment rising to elevate the proposed road over the railway will be within this area and has the potential to interrupt the flowing, gentle lines of the upper valley landform. However, as displayed by viewpoints 9, 11 and 12, the landform is subtle and trees and hedge planting limits visibility to short and medium range glimpse views;

- *'Small scale, varied landscape, tranquil and rural.'* The scale of the development will be large and linear in form. This will potentially conflict with the intimacy of this landscape. Rural tranquillity will be eroded;

- *'With riparian vegetation.'* Riparian vegetation is not present within the vicinity of option 1 and this aspect is unaffected.

This option will also require the removal of approximately 6500m^2 of woodland to the south of Poplar Road. On balance the sensitivity of this area to the development proposed is medium. The area affected by Option 2 is limited and the road will be at grade beyond the base of the embankment. The magnitude of effect locally is low and negligible in relation to the overall character area. The significance of the effect is negligible.

16.8.2 *Settled Tributary Farmland (Landscape Character Area B2)*

The road will pass at grade through this area for a total of approximately 600 metres to the centre and approximately 300 metres to the west. Rural tranquillity will be eroded, although this medium scale landscape is influenced by the southern edge of Attleborough and has urban fringe qualities. It is also enclosed, undulating in form and is relatively well treed. These aspects reduce visibility and increase the capacity of the landscape to accommodate the development proposed. The sensitivity of the landscape is low. The magnitude of effect locally is also low and negligible in relation to the overall character area. The significance of the effect is negligible.

16.8.3 *Plateau Farmland (Landscape Character Area E3)*

This area has well treed field boundaries with hedges and occasional woodland. However, overall, the landscape is open and expansive and visibility more widespread than areas to the west. Approximately 900 metres of the eastern section of the Option 2 proposals extend into this area and will cut across the grain of the landscape. Although it will be at grade the traffic, carriageway and other elements will be visible. The sensitivity of the landscape is medium. The magnitude of effect locally is also medium and negligible in relation to the overall character area. The significance of the effect is low.

Significant visual effects have been recorded at the following viewpoints, which are indicated on Figure 16/1. The actual viewpoints are shown on Figures 16/2 and 16/3. Although descriptions of effects upon all viewpoints are recorded within Table 16.8, chainages referenced in the table are those that appear on Drawing Number CS/060268/SK02.

- **Viewpoint 1.** The development will be visible to the south on lower lying land before receding beyond intervening vegetation. The carriageway and footways will be visible, with traffic and lighting more prominent. Overall, views from housing will be glimpsed, filtered and oblique.

- **Viewpoint 2.** This alignment will be seen extending across the field in the foreground and to the northwest. The landform falls away from the viewpoint and then rises and the road will therefore be visible extending up the east facing slopes in the middle ground before rising over the ridgeline. Sections of the route on the facing slopes will be most visible, with closer section of the route screened by the roadside hedge along the B1077. This hedge will also screen views from the footpath, although middle distance sections, east of Leys Cottage, will be visible.

- **Viewpoint 5.** A section of the alignment from around Chainage 1900 will be clearly visible extending from a relative high point to the north of Leys Cottage, south-west across arable farmland as far as the railway to the west. The landscape is open and all elements will be visible, including hard surfaces, vehicles and lighting. Vegetation loss of woodland to the south of Poplar road will be visible, along with the embankment and bridge across the railway. Sections of the road beyond the railway, however, will be obscured by vegetation and will not be visible.

- **Viewpoint 8.** The eastern extent of the road corridor will be visible from around Chainage 400 to 0 extending across a small field in short distance views east. The view will be open from the footpath, although some filtering will occur from garden vegetation. The embankment and rail crossing may also be visible further east, although this will be filtered by intervening vegetation. The hard surfacing, vehicles, lighting and signage will all be seen.

- **Viewpoint 10.** Views, either glimpsed, filtered or open, depending on intervening vegetation and orientation, from residential properties along Fowlers Lane and Poplar will be available. The woodland forming a backcloth to this area will be removed and replaced with embankments and the rail crossing for the proposed alignment. This will be a dominating element in views south and together with traffic, signage and lighting will reinforce the urban fringe characteristics already prevalent in this area.

- **Viewpoint 11.** This viewpoint is located on the proposed alignment as it crosses Poplar Road. It is envisaged that an underpass below the embankment will be provided to avoid issues of severance. The embankments, traffic and other vertical elements will have substantial impact on this viewpoint, due to proximity, as well as adjacent properties overlooking the existing rural landscape. To the east the proposed route will be visible as far as around chainage 1300, after which vegetation and landform will screen any potential views.

- **Viewpoint 15.** Direct and filtered views are available south across a small scale rural landscape, well vegetated with trees and hedges. The embankments and rail crossing will be visible with short range views and will be dominant large scale elements within the landscape. Traffic, lighting and other vertical elements will also be clearly visible. Sections of the proposed development between Chainage 0 and 400 and between 700 and 2900 will not be visible from the viewpoint although sections to the west may be visible from the residential property.

Overall, the visual appraisal demonstrates that visual effects will, again be localised, due to the gentle topography and the extent of tree planting. The area along the corridor also contains relatively few sensitive receptors. Those that are affected to a significant degree will include:

- Housing at Foundry Corner. Rear elevation second floor filtered views south east are available from around 12 properties;
- The public footpath along Bunn's Bank. Direct views out to the north west onto the proposed alignment are available from the intersection with the B1077;
- The setting of Scheduled Ancient Monument Bunn's Bank. Clarification of the significance of this may be needed with a Cultural Heritage specialist;
- Footpath/bridleways along Fowlers Lane/Poplar Road. Varied views will be available depending on vegetation, distance from proposed route etc;
- Detached properties along Fowlers Lane/Poplar Road. Approximately 4 properties will be affected;
- Detached properties along Hargham Road. Approximately 2 properties will be affected;
- A detached property on London Road B1077;
- Public Right of Way BR5, extending west from London Road B1077.

16.9 OPTION 3

It is anticipated that this option will have a link road like appearance with a 7.3 metre carriageway width and a 3 metre width shared footways/ cycleways on the north side only. A verge 0.5 metres in width will separate the footway from the carriageway. The total width is likely to be approximately 12.8 metres.

- Approximately 700 linear metres of native hedgerow or shelter belt type planting following field boundaries will be within the footprint of the route and will require removal;
- Approximately 750m^2 of woodland will be within the footprint of the route and will require removal;

- The route is approximately 3150 metres in length and will require three arm roundabout to the west and a four arm roundabout to the east. Total land-take of predominantly arable agricultural land required for this option is estimated to be approximately 40,300m^2;

- The route will sever Leys Lane to the south of Leys Farm;

- The route will sever Hargham Road to the south of Portmere Farm. A junction will be required.

- An embankment approximately 660 metres in length and rising to approximately 6 metres will be needed to facilitate access across the railway line. The footprint for this element is approximately 19,800m^2.

The woodland, trees, hedges and other vegetation within the study area are evaluated as medium sensitivity to change. The direct effect, comprising removal of elements within the footprint of the proposed development, will have a medium magnitude of change. This equates to an effect of moderate significance.

Provided that Leys Lane, Footpath FP7 and Hargham Road are well integrated with the development, it is likely that effects on severance will be negligible. The proposed road will be at grade at the crossing with Leys Lane and Hargham Road.

Indirect effects on landscape character are outlined below:

16.9.1 River Thet Valley (Landscape Character Area A2)

This area has an enclosed character, with occasional views framed by small blocks of wet woodland and localised blocks of mixed plantation woodland. The field pattern is small scale and irregular, with pastoral/rough grazed field boundaries formed by ditches and willow/alder belts. The urban edge and urban fringe of Attleborough is less evident along this route, and the area is more tranquil and rural. Other aspects of this character area that will, however, be sensitive to the proposed development will include the following:

- *'Broad shallow valley.'* The embankment rising to elevate the proposed road over the railway will be within this area and has the potential to interrupt the flowing, gentle lines of the upper valley landform. However, the landform is subtle and trees and hedge planting limits visibility to short and medium range glimpse views;

- *'Small scale, varied landscape, tranquil and rural.'* The scale of the development will be large and linear in form. This will potentially conflict with the intimacy of this landscape. Rural tranquillity will be eroded;

- *'With riparian vegetation.'* Riparian vegetation is not present within the vicinity of option 1 and this aspect is unaffected.

On balance the sensitivity of this area to the development proposed is medium. The area affected by Option 2 is limited and the road will be at grade beyond the base of the embankment. The magnitude of effect locally is low and negligible in relation to the overall character area. The significance of the effect is negligible.

16.9.2 *Settled Tributary Farmland (Landscape Character Area B2)*

The road will pass at grade through this area for a total of approximately 1200 metres to the centre and around 300 metres to the west. Rural tranquillity will be eroded. However, the landscape is enclosed, undulating in form and is relatively well treed. These aspects reduce visibility and increase the capacity of the landscape to accommodate the development proposed. The sensitivity of the landscape is low. The magnitude of effect locally is also low and negligible in relation to the overall character area. The significance of the effect is negligible.

16.9.3 *Plateau Farmland (Landscape Character Area E3)*

This area has well treed field boundaries with hedges and occasional woodland. However, overall, the landscape is open and expansive and visibility more widespread than areas to the west. Approximately 900 metres of the eastern section of the Option 2 proposals extend into this area and will cut across the grain of the landscape. Although it will be at grade the traffic, carriageway and other elements will be visible. The sensitivity of the landscape is medium. The magnitude of effect locally is also medium and negligible in relation to the overall character area. The significance of the effect is low.

Significant visual effects have been recorded at the following viewpoints, which are indicated on Figure 16/1. The actual viewpoints are shown on Figures 16/2 and 16/3. Although descriptions of effects upon all viewpoints are recorded within Table 16.8, chainages referenced in the table are those that appear on Drawing Number CS/060268/SK03.

- **Viewpoint 2.** The three arm roundabout will dominate the foreground, particularly from the footpath which is aligned east to west and allows direct views towards the proposed alignment. The proposed carriageway/footway and traffic using the route will be seen to the rear receding into the middle ground as it passes over the brow of a shallow hill. After approximately 400 metres, the road extends over land sloping away from the viewpoint and to the south and consequently visibility of the road is reduced and then eliminated through intervening landform and vegetation.

- **Viewpoint 5.** A section of the alignment from around Chainage 1500 will be clearly visible extending from a relative high point to the south of Leys Farm, west across arable farmland as far as the railway to the south-west. The landscape is open and all elements along the section will be visible, including hard surfaces, vehicles and lighting. Vegetation loss of mature shelterbelt tree planting along Leys Lane and north of Leys Plantation will also be visible. The embankment and bridge across the railway will be seen to the southwest, along with tree planting within the footprint. Sections of the road beyond the railway, however, will be obscured by vegetation and will not be visible.

- **Viewpoint 11.** Glimpse views of the proposed route will be available south-east across arable farmland, framed by woodland, shelter belt tree planting, hedges and garden vegetation. Sections of the proposed route as it passes from Leys Lane west across open arable farmland will be visible, with traffic and vertical elements visible. The rail crossing will not be visible due to intervening vegetation. Views are, however, relatively distant and interrupted by vegetation.

- **Viewpoint 13.** The western extent of the development, i.e. Chainage 0 to 350 will be visible in views north from the detached property across an open arable field. Vertical elements, such as traffic, lighting, signage etc will be visible only. Glimpse views from the road will be available, but these will be filtered by intervening roadside vegetation.

- **Viewpoint 14.** This viewpoint is located at the intersection of the proposed development alignment and Hargham Road. A junction will be required and this will necessitate removal of vegetation comprising roadside hedges. Open views will be available both east and west along the proposed route and hard surfaces, traffic, lighting and signage will be visible within these short range views. The embankment and road bridge will also be visible further to the east. The landscape is well wooded and undulating and this helps integrate the development to an extent. However, it is also tranquil and views appear rural and picturesque with very limited intrusion of urban elements. The proposed development will be a dominating element within views. Whilst this Listed Building is well enclosed by mature garden and woodland vegetation, the setting will inevitably be affected.

Overall, the visual appraisal demonstrates that visual effects will be localised, due to the gentle topography and the extent of tree planting. The area along the corridor also contains relatively few sensitive receptors. Those that are affected to a significant degree will include:

- The public footpath along Bunn's Bank. Direct views out onto the proposed alignment are available from the intersection with the B1077;
- The setting of Scheduled Ancient Monument Bunn's Bank. Clarification of the significance of this may be needed with a Cultural Heritage specialist;

- Footpath/bridleways along Fowlers Lane/Poplar Road. Varied views will be available from many sections of this route, depending on vegetation, distance from proposed route etc.

- Detached properties along and off Hargham Road. Approximately 3 properties will be affected, including Portmere Farm.

VP No.	Viewpoint Name	Viewpoint Sensitivity	Magnitude of Effect Year 1	Description of Effects	Significance of Effect Year 1
1	B1077 Foundry Corner	Views from road are **low** sensitivity. Views from houses are **high** sensitivity	**Option 1**		
			High for both houses and road	The development will be prominent in the foreground, with corridor of the route receding into the middle ground, before extending into lower ground and receding behind the intervening landform. The carriageway and footways will be at grade. The roundabout, signage, etc will dominate oblique and direct views from the B1077. Views from the rear of the houses will be filtered by garden vegetation, but will take in the carriageway and footways and associated elements, including traffic. The bypass to the rear of the housing will also be visible, along with traffic, lighting etc.	**Moderate/Minor** for road (i.e. not significant) **Major** for houses (i.e. significant)
			Option 2		
			Medium for houses. **Low** for road	The development will be visible to the south on lower lying land before receding beyond intervening vegetation. The carriageway and footways will be visible, with traffic and lighting more prominent. Overall, views from both housing and road will be glimpsed, filtered and oblique.	**Major/Moderate** for housing. **Minor** for road
			Option 3		
			No effect	The alignment extends across land falling away from the viewpoint. The development will be hidden by intervening landform and vegetation.	**Negligible/None** (i.e. not significant)
2	B1077 Bunn's Bank	Views from road are **low** sensitivity. Views from footpath are **high** sensitivity	**Option 1**		
			Low for road. **Negligible** for footpath	A small section of the road, approximately 300 metres in length, will be visible in oblique glimpse views north from the road. Some vegetation loss will be seen where the road cuts through hedge at Chainage 2580. Vertical elements, such as traffic and lights, will be most visible. The carriageway will be at grade and will be seen on high ground, resulting in reduced visibility. Vegetation comprising the roadside hedge and woodland on buns Bank will screen effects from the footpath.	**Negligible/None** (i.e. not significant)
			Option 2		
			Medium for footpath. **Low** for road.	This alignment will be seen extending across the field in the foreground and to the northwest. The landform falls away from the viewpoint and then rises and the road will therefore be visible extending up the east facing slopes in the middle ground before rising over the ridgeline. Sections of the route on the facing slopes will be most visible, with closer section of the route screened by the roadside hedge along the B1077. This hedge will also screen views from the footpath, although middle distance sections, east of Leys Cottage, will be visible.	**Major/Moderate** for footpath. **Minor** for road

VP No.	Viewpoint Name	Viewpoint Sensitivity	Magnitude of Effect Year 1	Description of Effects	Significance of Effect Year 1
			Option 3		
			High for footpath **Medium** for B1077 road	The three arm roundabout will dominate the foreground, particularly from the footpath which is aligned east to west and allows direct views towards the proposed alignment. The proposed carriageway/footway and traffic using the route will be seen to the rear receding into the middle ground as it passes over the brow of a shallow hill. After approximately 400 metres, the road extends over land sloping away from the viewpoint and to the south and consequently visibility of the road is reduced and then eliminated through intervening landform and vegetation.	**Major** for footpath (i.e. significant). **Minor/Moderate** for road (i.e. not significant)
3	Fen Street, Puddledock	Views from road are **low** sensitivity. Views from footpath are **high** sensitivity	**Option 1**		
			Negligible	The proposed alignment will not be visible from this viewpoint.	**Negligible/None** (i.e. not significant)
			Option 2		
			Negligible	The proposed alignment will not be visible from this viewpoint.	**Negligible/None** (i.e. not significant)
			Option 3		
			Negligible	The proposed alignment will not be visible from this viewpoint.	**Negligible/None** (i.e. not significant)
4	Leys Lane/Old Buckenham Fen	Views from road are **low** sensitivity. Views from promoted long distance footpath are **high** sensitivity. Views from the Residential property are **high** sensitivity	**Option 1**		
			Negligible	Extent of vegetation, distance and landform will screen proposed development.	**Negligible/None** (i.e. not significant)
			Option 2		
			Negligible	Extent of vegetation, distance and landform will screen proposed development.	**Negligible/None** (i.e. not significant)
			Option 3		
			Low for all receptors.	Glimpse views of this alignment may be possible in the middle distance and to the fore of Leys Farm. Elements likely to be visible will include vehicles using the road and lighting. In addition the removal of trees within the footprint of the road will also be visible. However, the extent of mature tree and hedge planting, including Old Buckenham Fen and the distance of the development from the viewpoint will reduce the magnitude of effects considerable. Intervening landform will also screen the majority of the route to the west and to the east.	**Moderate/Minor** for residential, footpath/ long distance route users (i.e. not significant) **Minor/Negligible** for road (i.e. not significant)

VP No.	Viewpoint Name	Viewpoint Sensitivity	Magnitude of Effect Year 1	Description of Effects	Significance of Effect Year 1
5	Footpath, Fowlers Lane.	Views from Public Footpath are **high** sensitivity.	**Option 1**		
			High	A section of the alignment from around Chainage 1700 will be clearly visible extending from a relative high point to the north of Leys Cottage, west across arable farmland as far as the railway. The landscape is open and all elements will be visible, including hard surfaces, vehicles and lighting. Some vegetation loss will be visible as the road cuts though field boundaries to the north. The embankment and bridge across the railway is also likely to be visible, although intervening vegetation is likely to partially filter and obscure these views. Sections of the road beyond the railway, however, will be obscured by vegetation and will not be visible.	**Major** (i.e. significant)
			Option 2		
			High	A section of the alignment from around Chainage 1900 will be clearly visible extending from a relative high point to the north of Leys Cottage, south-west across arable farmland as far as the railway to the west. The landscape is open and all elements will be visible, including hard surfaces, vehicles and lighting. Vegetation loss of woodland to the south of Poplar road will be visible, along with the embankment and bridge across the railway. Sections of the road beyond the railway, however, will be obscured by vegetation and will not be visible.	**Major** (i.e. significant)
			Option 3		
			Medium	A section of the alignment from around Chainage 1500 will be clearly visible extending from a relative high point to the south of Leys Farm, west across arable farmland as far as the railway to the south-west. The landscape is open and all elements along the section will be visible, including hard surfaces, vehicles and lighting. Vegetation loss of mature shelterbelt tree planting along Leys Lane and north of Leys Plantation will also be visible. The embankment and bridge across the railway will be seen to the southwest, along with tree planting within the footprint. Sections of the road beyond the railway, however, will be obscured by vegetation and will not be visible.	**Major/Moderate** (i.e. significant)
6	Slough Lane, Attle-borough	Views from road are **low** sensitivity. Views from the	**Option 1**		
			Medium/ low	A section of the road around 450 metres in length will be seen running east to west on the ridgeline around 0.5 kilometres south of the viewpoint from Chainage 2000 to 2450. The road will be constructed at grade and vertical elements only will be seen,	**Minor/Negligible** for road (i.e. not significant) **Moderate** for residential

VP No.	Viewpoint Name	Viewpoint Sensitivity	Magnitude of Effect Year 1	Description of Effects	Significance of Effect Year 1
		residential property are **high** sensitivity		including lighting, traffic and signage. These elements will be partially back-clothed against shelterbelt woodland planting, possibly increasing prominence slightly. Further east and west, the road will be screened by intervening vegetation.	properties (i.e. not significant)
			Option 2		
			Negligible	Extent of vegetation, distance and landform will screen proposed development.	**Negligible/None** (i.e. not significant)
			Option 3		
			Negligible	Extent of vegetation, distance and landform will screen proposed development.	**Negligible/None** (i.e. not significant)
7	Leys Lane, Attle-borough	Views from road are **low** sensitivity. Views from the residential property are **high** sensitivity	**Option 1**		
			Medium	A small section of the road approximately 300 metres in length will be seen running east to west on the ridgeline around 300 metres south of the viewpoint from Chainage 2000 to 2300. These views will be available as glimpses or filtered by foreground garden vegetation. The proposed road will be constructed at grade and vertical elements only will be seen, including lighting, traffic and signage. These elements will be back-clothed against shelterbelt woodland planting, possibly increasing prominence slightly. Further east and west, the road will be screened by intervening vegetation and landform.	**Minor/Negligible** for road (i.e. not significant) **Moderate** for residential properties (i.e. not significant)
			Option 2		
			Negligible	Extent of intervening vegetation and landform will screen proposed development.	**Negligible/None** (i.e. not significant)
			Option 3		
			Negligible	Extent of intervening vegetation and landform will screen proposed development.	**Negligible/None** (i.e. not significant)
8	B1077 London Road/PRoWB R5	Views from road are **low** sensitivity. Views from the residential property and Public Footpath	**Option 1**		
			Low	Filtered and glimpse views from the residential property may be available north-east towards the proposed corridor. The embankment and rail crossing, together with vegetation loss within the footprint will be visible in the middle distance. The alignment between Hargham Road and the B1077 London Road may intrude slightly, with visibility likely to be restricted to vehicles and lighting only.	**Minor/Negligible** for road (i.e. not significant) **Moderate** for residential property and footpath (i.e. not significant)

VP No.	Viewpoint Name	Viewpoint Sensitivity	Magnitude of Effect Year 1	Description of Effects	Significance of Effect Year 1
		are **high** sensitivity	**Option 2**		
			High	The eastern extent of the road corridor will be visible from around Chainage 400 to 0 extending across a small field in short distance views east. The view will be open from the footpath, although some filtering will occur from garden vegetation. The embankment and rail crossing may also be visible further east, although this will be filtered by intervening vegetation. The hard surfacing, vehicles, lighting and signage will all be seen.	**Major** for residential property and footpath (i.e. significant) **Moderate/Minor** for road (i.e. not significant)
			Option 3		
			Negligible	Extent of intervening vegetation and landform will screen proposed development.	**Negligible/None** (i.e. not significant)
9	Fowlers Lane, Attle-borough	Views from road are **low** sensitivity. Views from the residential properties and Public Footpath are **high** sensitivity	**Option 1**		
			High	Open views south across arable farmland will allow visibility of the embankments and rail crossing and other vertical elements, including traffic. These will be seen at a distance of approximately 400 metres. The embankments will interrupt the panoramic views south, and their imposition will require removal of mature trees/woodland following the railway alignment. The intrusion of urban elements will also reinforce the urban fringe type character that prevails in this area.	**Major for** residential property and footpath (i.e. significant) **Moderate/Minor** for road (i.e. not significant)
			Option 2		
			Negligible	Extent of intervening vegetation and landform will screen or significantly filter proposed development.	**Negligible/None** (i.e. not significant)
			Option 3		
			Negligible	Extent of intervening vegetation and landform will screen proposed development.	**Negligible/None** (i.e. not significant)
10	Poplar Road, Attle-borough	Views from road are **low** sensitivity. Views from the residential properties and Public Footpath are **high**	**Option 1**		
			Negligible	Extent of intervening vegetation and landform will screen proposed development.	**Negligible/None** (i.e. not significant)
			Option 2		
			High	Views, glimpsed, filtered or open, depending on intervening vegetation and orientation, from residential properties along Fowlers Lane and Poplar will be available. The woodland forming a backcloth to this area will be removed and replaced with embankments and the rail crossing for the proposed alignment. This	**Major** for residential property and footpath (i.e. significant). **Moderate/Minor** for road (i.e. not significant)

VP No.	Viewpoint Name	Viewpoint Sensitivity	Magnitude of Effect Year 1	Description of Effects	Significance of Effect Year 1
		sensitivity		will be a dominating element in views south and together with traffic, signage and lighting will reinforce the urban fringe characteristics already prevalent in this area.	
			Option 3		
			Negligible	Extent of intervening vegetation and landform will screen proposed development.	**Negligible/None** (i.e. not significant)
11	Poplar Road, Attle-borough	Views from road are **low** sensitivity. Views from the residential properties and Public Footpath are **high** sensitivity	**Option 1**		
			High	This viewpoint is located on the proposed alignment as it crosses Poplar Road. It is envisaged that an underpass below the embankment will be provided to avoid issues of severance. The embankments, traffic and other vertical elements will have substantial impact on this viewpoint, due to proximity, as well as adjacent properties overlooking the existing rural landscape. To the east the proposed route will be visible as far as around Chainage 1300, after which vegetation and landform will screen any potential views.	**Major** for residential property and footpath (i.e. significant). **Moderate/Minor** for road (i.e. not significant)
			Option 2		
			Medium	Glimpse views of the proposed route will be available southeast across arable farmland, framed by woodland, shelter belt tree planting, hedges and garden vegetation. Sections of the proposed route as it passes from Leys Lane south-west across open arable farmland will be visible, with traffic, hard surfacing and vertical elements visible. South of Poplar Road the embankments and rail crossing may be visible, but some filtering and screening will occur from intervening vegetation.	**Major/Moderate** for residential property and footpath (i.e. significant) **Minor** for road (i.e. not significant)
			Option 3		
			Low	Glimpse views of the proposed route will be available southeast across arable farmland, framed by woodland, shelter belt tree planting, hedges and garden vegetation. Sections of the proposed route as it passes from Leys Lane west across open arable farmland will be visible, with traffic and vertical elements visible. The rail crossing will not be visible due to intervening vegetation. Views are relatively distant and much interrupted by vegetation.	**Minor** for residential property and footpath (i.e. significant). **Minor** for road (i.e. not significant)
12	Poplar Road, Attle-borough	Views from road are **low** sensitivity. Views from the	**Option 1**		
			High	The embankments and bridge as well as traffic and lighting will be visible extending across arable farmland between residential properties. The landscape is flat or gently sloping and the proposed structure will be a dominating element in the small scale	**Major** for residential property and footpath (i.e. significant). **Moderate/minor** for road (i.e.

VP No.	Viewpoint Name	Viewpoint Sensitivity	Magnitude of Effect Year 1	Description of Effects	Significance of Effect Year 1
		residential properties and Public Footpath are **high** sensitivity		landscape and interrupt the open views south.	not significant)
			Option 2		
			Negligible	Extent of intervening vegetation and landform will screen proposed development.	**Negligible/None** (i.e. not significant)
			Option 3		
			Negligible	Extent of intervening vegetation and landform will screen proposed development.	**Negligible/None** (i.e. not significant)
13	Detached property and minor road, Hargham Road	Views from the residential property are **high** sensitivity.	**Option 1**		
			Negligible	Extent of intervening vegetation and landform will screen proposed development.	**Negligible/None** (i.e. not significant)
			Option 2		
			Negligible	Extent of intervening vegetation and landform will screen proposed development.	**Negligible/None** (i.e. not significant)
			Option 3		
			Medium	The western extent of the development, i.e. Chainage 0 to 350 will be visible in views north from the detached property across an open arable field. Vertical elements, such as traffic, lighting, signage etc will be visible only. Glimpse views from the road will be available, but these will be filtered by intervening roadside vegetation.	**Major/Moderate** for residential property and footpath (i.e. significant) **Minor** for road (i.e. not significant)
14	Portmere Farm, Hargham Road	Views from road are **low** sensitivity. Views from the residential property are **high** sensitivity	**Option 1**		
			Negligible	Extent of intervening vegetation and landform will screen proposed development.	**Negligible/None** (i.e. not significant)
			Option 2		
			Negligible	Extent of intervening vegetation and landform will screen proposed development.	**Negligible/None** (i.e. not significant)
			Option 3		
			High	This viewpoint is located at the intersection of the proposed development alignment and Hargham Road. A junction will be required and this will necessitate removal of vegetation comprising roadside hedges. Open views will be available both east and west along the proposed route and hard surfaces, traffic, lighting and signage will be visible within these short range views. The embankment and road bridge will also be	**Major** for residential property and footpath (i.e. significant) **Moderate/minor** for road (i.e. not significant)

VP No.	Viewpoint Name	Viewpoint Sensitivity	Magnitude of Effect Year 1	Description of Effects	Significance of Effect Year 1
				visible further to the east. The landscape is well wooded and undulating and this helps integrate the development to an extent. However, it is also tranquil and views appear rural and picturesque with very limited intrusion of urban elements. The proposed development will be a dominating element within views. Whilst this Listed Building is well enclosed by mature garden and woodland vegetation, the setting of this Listed building will inevitably be affected.	
15	Haverscroft Farm/ Fowlers Lane/ Hargham Road	Views from road are **low** sensitivity. Views from the footpath are **high** sensitivity. Views from the residential property are **high** sensitivity	**Option 1**		
			Low	Glimpsed and filtered views north-east will be available between mixed tree and hedge planting. The embankment and rail crossing will be visible along with traffic and other vertical elements. Any associated vegetation loss will also be evident. Although large in scale in comparison to this small scale landscape, the well-treed character of the landscape helps reduce the extent and magnitude of effects.	**Minor** for residential property and footpath (i.e. significant). **Minor** for road (i.e. not significant)
			Option 2		
			High	Direct and filtered views are available south across a small scale rural landscape, well vegetated with trees and hedges. The embankments and rail crossing will be visible with short range views and will be dominant large scale elements within the landscape. Traffic, lighting and other vertical elements will also be clearly visible. Sections of the proposed development between Chainage 0 and 400 and between 700 and 2900 will not be visible from the viewpoint although sections to the west may be visible from the residential property.	**Major** for residential property and footpath (i.e. significant) **Moderate/Minor** for road (i.e. not significant)
			Option 3		
			Negligible	Extent of intervening vegetation and landform will screen proposed development.	**Negligible/None** (i.e. not significant)
16	Haverscroft House, Hargham road	Views from road are **low** sensitivity. Views from residential properties are **high** sensitivity	**Option 1**		
			High	This viewpoint is located at the intersection of the proposed route with Hargham Road and is representative of two detached properties located adjacent to the route. A junction will be required at this location and it is also likely that some large scale regrading works will be needed to integrate the proposed route, which will be rising to maintain access over the railway, with the lower elevations of Hargham Road. Traffic, lighting, signage and other vertical elements will be visible. The hard surfaces will also be seen extending along the route to the west and rising over the railway on	**Major** for residential property (i.e. significant) **Moderate/Minor** for road (i.e. not significant)

VP No.	Viewpoint Name	Viewpoint Sensitivity	Magnitude of Effect Year 1	Description of Effects	Significance of Effect Year 1
				embankments.	
			Option 2		
			Negligible	Extent of intervening vegetation and landform will screen proposed development.	**Negligible/None** (i.e. not significant)
			Option 3		
			Negligible	Extent of intervening vegetation and landform will screen proposed development.	**Negligible/None** (i.e. not significant)

Table 16.8 Description of Visual Effects from Viewpoints 1 to 16 (Figures 6/2 and 6/3)

16.10 SUMMARY

The assessment has identified that the landscape within the study area has the potential capacity to accommodate the type of development proposed. The extent of visibility is restricted by mature tree, hedge and other planting and the landform throughout is gently undulating. Effects are in all cases localised and sensitive receptors likely to be significantly affected will include adjacent houses and footpaths.

Option 1 is likely to present relatively high impacts issues in relation to direct effects as a consequence of loss of woodland south of Poplar Road and other vegetation elsewhere. It is also likely to result in significant local effects on adjacent housing at Poplar Road, London Road and Hargham Road.

Option 2 will, on balance, have the most significant direct effects on the landscape. This will include the loss of approximately 900 metres of hedgerow and 6500m^2 of woodland.

Option 3 offers effects of least significance, in comparison, approximately 700 metres of hedgerow and 750m^2 of woodland. Land-take for Option 3 is also the lowest at around 40,300m^2.

Options 1 and 3 have a similar balance of effect in relation to loss of vegetation, although land-take for Option 1 will be slightly increased. However, Option 1 will, due to its proximity to adjacent residential properties, result in increased visual effects in comparison to the other options. All options will have a minor or negligible impact on landscape character.

The Preferred Option, in terms of impacts on landscape and visual effects, is Option 3.