

A421 Great Barford Bypass

Environmental Statement



Part 1 - Text

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1.1 Scope of this Document

This Environmental Statement summarises the results of an Environmental Impact Assessment (EIA) undertaken on the proposed Great Barford Bypass. The Bypass would consist of a 7.7km dual carriageway, designed to provide traffic relief to the villages of Great Barford and Roxton in Bedfordshire. It would improve the link between the A421 Bedford Southern Bypass and the A1, part of the strategic corridor between Milton Keynes and Cambridge. Construction of the Bypass would substantially reduce through traffic flow in the villages of Great Barford and Roxton, leading to a range of environmental and social benefits.

The current study has been undertaken in accordance with the latest Design Manual for Roads and Bridges (DMRB) Volume 11¹ standards and to dovetail with the Guidance on the Methodology for Multi Modal Studies (GOMMMS)².

1.2 Scheme Objectives and Statement of Key Environmental Issues

The principal objectives of the scheme are as follows.

- Removal of trunk road traffic from approximately 7.7km of the existing A421 that runs through the village of Great Barford and north of the village of Roxton, resulting in improved safety for pedestrians and local road users.
- Improved travelling times for trunk road traffic.
- Increased safety for trunk road traffic.
- Environmental improvements for the villages of Great Barford and Roxton, principally reduced community severance.

The general study area is shown in Figure 1 and the proposed scheme location is shown in Figure 2.

The scheme would also include appropriate mitigation measures to minimise environmental effects. Key benefits include the following.

Environment

- Properties along the existing A421 in Great Barford would experience lower noise levels.
- Properties in Great Barford would experience improved air quality.

Safety

- Accidents numbers would be reduced. (The available accident statistics for 1997 to 1999 inclusive show a total of 41 casualties over 3 years [32 slight, 8 serious and 1 fatal]. This is a significantly higher than average rate when compared to similar rural roads.)

¹ HMSO. Design Manual for Roads and Bridges. Volume 11 Environmental Assessment. 1994 and subsequent revisions.

² DETR. *Guidance on the Methodology for Multi Modal Studies*. 2000.

Economy

- Journey timesavings for road traffic.
- Maintenance of economic driving speeds.

Accessibility

- Enhanced pedestrian, cyclist and equestrian safety and amenity value.
- Enhanced climate for operation and growth of public transport (buses).
- Reduced severance leading to greater unification of the Great Barford community currently bisected by the A421.

Integration

- Accord with keynote Central Government policies, Regional Policies, Local Policies and Local Plans.

1.3 Background to the Project

1.3.1 Current Scheme Prioritisation - “A New Deal for Transport: Better for Everyone”; “A New Deal for Trunk Roads”

The current scheme was prioritised in the 1998 White Paper “A New Deal for Trunk Roads”³, which followed “A New Deal for Transport: Better for Everyone”⁴. For the South-east Region, the A421 Great Barford Bypass is one of the 6 schemes listed in “A New Deal for Trunk Roads Targeted Programme of Improvements”. It states “A421 Great Barford Bypass - will provide a safer and healthier environment for Great Barford by removing 75% of traffic and eliminate a bottleneck on core route from Milton Keynes to Cambridge”.

In “A New Deal for Trunk Roads”, extensive consultation was carried out with local authorities, business and environmental interest groups on the eastern region’s trunk road network, resulting in priorities for action being identified. The following are some of the areas of action that were identified.

- “Improvement of access to more remote areas of region;
- Dealing with serious congestion problems on main routes;
- Removing trunk road traffic from communities to improve the environment and safety for residents;
- Addressing safety problems on single carriageway trunk roads”.

The proposed Great Barford Bypass would comply with these objectives.

1.3.2 Publication of Draft Orders

The relevant Orders for the proposed Great Barford Bypass are as follows.

- The A421 Trunk Road (Great Barford Bypass and Slip Roads) Order 20.
- The A421 Trunk Road (Great Barford Bypass) DeTrunking Order 20.
- The A421 Trunk Road (Great Barford Bypass) Compulsory Purchase Order 20.
- The A421 Trunk Road (Great Barford Bypass) Line Order 20.

³ DETR (now DTLR). “A New Deal for Trunk Roads”. July 1998.

⁴ DETR (now DTLR). “A New Deal for Transport: Better for Everyone”. (July 1998).

1.4 The Requirements for Environmental Assessment

This Environmental Statement (ES) summarises the findings of a detailed Environmental Impact Assessment (EIA) undertaken as part of the scheme development and evaluation for the proposed Great Barford Bypass. The EIA was conducted in accordance with the requirements of EC Directive 85/337/EC⁵, as amended by Directive 97/11/EC⁶ and as applied by the Highways (Assessment of Environmental Effects) Regulations, 1999⁷, which amends Part VA of the Highways Act, 1980⁸.

1.5 Scope and Content of the Environmental Statement

The methodology applied in undertaking the EIA is derived from the Design Manual for Roads and Bridges (DMRB) Volume 11: Environmental Assessment (footnote 1) (and subsequent updates) and Guidance on the Methodology for Multi Modal Studies (footnote 2).

The scope of the Environmental Statement is as follows.

- Describe the proposed development.
- Identify the main effects that the scheme is likely to have on the environment.
- Describe proposed mitigation measures and their effectiveness.
- Summarise the resultant key issues in relation to environmental quality.

The Environmental Statement is designed to ensure that the likely effects of new development on the environment are fully understood and taken into account before the development is allowed to proceed.

Full details of the technical studies undertaken in each of the environmental topic areas of the assessment are presented separately, in volumes supporting this Environmental Statement. A non-technical summary, highlighting the main issues of the study, has been prepared as a separate document. It has been bound into this ES for reference.

1.6 Structure of the Environmental Statement

The Environmental Statement is divided into 7 chapters, as follows.

1. Introduction
2. Alternatives and Development of the Preferred Route
3. Existing Situation
4. The Proposed Scheme
5. Significant Impacts of the Scheme
6. Mitigation Measures
7. Residual Impacts and Conclusion

Supporting Technical Information comprises 13 separate specialist environmental reports covering individual subjects in detail. These reports are listed below.

⁵ European Union Directive 85/337/EC. The Assessment of the Effect of Certain Public and Private Projects on the Environment. 27th June 1985.

⁶ European Union Directive 97/11/EC. Amendment to Directive 85/337/EEC on the Assessment of the Effects of Certain Public and Private Projects on the Environment. 3rd March 1997.

⁷ HMSO. Highways (Assessment of Environmental Effects) Regulations, 1999. SI No 369.

⁸ HMSO. The Highways Act, 1980.

- Volume 1 - Air Quality
- Volume 2 – Cultural Heritage
- Volume 3 – Disruption Due to Construction
- Volume 4 – Ecology and Nature Conservation
- Volume 5 – Landscape Effects
- Volume 6 – Visual Impacts
- Volume 7 – Traffic Noise and Vibration
- Volume 8 – Pedestrians, Cyclists and Community Effects
- Volume 9 – Vehicle Travellers
- Volume 10 – Water Quality and Drainage
- Volume 11 – Geology and Soils
- Volume 12 – Policies and Plans
- Volume 13 – Land Use

1.7 Consultation

The list of organisations and parties, both statutory and non-statutory, who have been consulted during the preparation of the EIA are presented in Appendix A.

Landowners affected by the proposed Bypass have also been contacted and discussions held regarding mitigation for issues such as alternative access routes to land parcels.

The Environmental Statement is a public document, open to public comment, as part of the statutory procedures to be followed.

If you wish to comment on the Environmental Statement, please write to:-

Highways Agency
 Room 244
 Heron House
 49-53 Goldington Road
 Bedford
 MK40 3LL

The closing date for comments is 17 April 2002.

2.1 Introduction

Development of the Preferred Route for the Great Barford Bypass scheme took place in the late 1980s, as described below.

2.2 Early Options

Initially, two corridors were identified for a Bypass, one to the north and one to the south of the village of Great Barford. Four northern options and one southern were examined, although other routes were considered but rejected on the grounds of greater environmental impact or poor economic performance or both.

The southern option exhibited greater dis-benefits than the northern corridor alignments, these being primarily issues relating to conservation, agricultural value and physical impact within the landscape. The number of demolitions and the severance of the Great Barford Conservation Area (located around All Saints Church to the south of the existing A421) were unacceptable when it was considered that the route did not effectively bypass the village of Great Barford and required land take of MAFF Grade 1 agricultural land.

By comparison, none of the northern options would involve demolition, and agricultural land lost would be MAFF Grades 2 and 3. Two options located north of Howbury Hall Park were dismissed following the decision to locate the eastern end of the Bedford Southern Bypass to the south-east of Howbury Hall Park.

The two remaining northern alignments were refined and presented for Public Consultation in November 1989 (see Figure 3). They were illustrated in the Public Consultation Document as the Inner Northern Route (Brown) and Outer Northern Route (Yellow). The Outer Northern Route was subsequently adopted as the Preferred Route.

The Inner Northern Route (Brown) would have diverged from the existing A421 at Water End, passed south of Brewers Hall Farm and just passed the western edge of Green End Conservation area. The alignment would have been carried on embankment over Green End Road before skirting the Great Barford Hill Conservation Area and rejoining the existing alignment at Roxton. This route would have had serious impacts on Green End, particularly related to visual intrusion issues around the Conservation Area. In addition, the impact of increased noise on Green End residents was a consideration. The route had no advantages over the other routes and, on the basis of these environmental disadvantages, was rejected from further consideration.

2.2.1 On-line Improvement

Consideration was given to on-line improvement of the existing A421, to upgrade the road to dual carriageway standard. This option failed in the basic objective of relieving the village of Great Barford of through traffic, and would have further added to the impact of the road on the village, thereby increasing community severance. The road alignment was inferior to any of the other options considered and would have required the demolition of a number of properties in the village fronting the existing road.

2.2.2 The Black Cat Extension

The decision to consider an extension to the Great Barford Bypass resulted from comments during public consultation in 1989. In July 1990 further public contributions were invited on the proposal to extend the Bypass eastwards from the proposed end point at Roxton Park, to the A1 at the Black Cat Roundabout (see Figure 3). A limited consultation was undertaken with only one route, after other routes were rejected on the grounds of greater environmental impact or poorer economic performance or both. The critical factors under consideration were primarily related to the proximity of the new road to Roxton. In addition, the severance of farmland was a major issue in locating the extension.

2.3 Route Alterations Undertaken

No route alterations have been made since the adoption of the Outer Northern (Yellow) option as the Preferred Route in 1992.

During development of the current scheme design, between January 2000 and November 2001, a number of detailed design options for the Water End junction have been considered, resulting in the development of the final “dumb-bell” solution. This involves the provision of a single bridge arrangement and an environmental bund along the north-western side of the junction. This arrangement minimises land take as it does not involve the provision of two bridges, and the environmental bund minimises visual effects from viewpoints in the eastern parkland at Howbury Hall.

3.1 Recognition of Problems

By virtue of its specific inclusion in key Transport Policies, such as “*A New Deal for Trunk Roads*”(see footnote 3), the overwhelming need for the Great Barford Bypass scheme is acknowledged by Central Government and Local Government. As stated in “*A New Deal for Trunk Roads*”, the Great Barford Bypass “*will provide a safer and healthier environment for Great Barford by removing 75% of traffic and eliminate a bottleneck on core route from Milton Keynes to Cambridge*”. Removal of this traffic would improve the environment for residents in Great Barford village living alongside the existing A421, specifically in terms of reduced traffic noise and improved air quality due to the reduction in traffic emissions.

3.2 This Section

This section of the Environmental Statement is divided into two parts. Firstly, current environmental problems on the existing route corridor are considered. Secondly, key issues of the existing environment of the proposed route corridor are described.

3.3 The Existing Route Corridor

3.3.1 Description and Summary of Issues

The A421 forms an important part of the corridor between Milton Keynes and Cambridge. The A421 is well used by vehicles of all types, particularly as containerisation has boosted trade links with Belgium, Holland and other European areas.

The village of Great Barford is located some 4km east of the town of Bedford. The village is linear in plan form and bisected by the existing A421, with its main axis running approximately perpendicular to the existing trunk road. The historic core of the village is based around Great Barford Bridge and All Saints Church, High Street, and is defined by the Great Barford Conservation Area. A secondary axis of development has formed along the A421.

The principal environmental issues relating to the existing route corridor are as follows.

- High traffic flow and congestion
- Poor air quality
- High traffic noise
- High levels of driver stress
- The effect of the above on the settings of Listed Buildings and Conservation Areas in Great Barford.
- Community severance.
- Pedestrian safety.

The extent of impaired accessibility and community severance is fairly severe in Great Barford, as the existing A421 effectively forms a barrier that bisects the village and its facilities into northern and southern areas. Consequently, whether travelling on foot, by bicycle or by car, residents living south of the A421 have to negotiate the heavy traffic when attempting to cross the A421 to access the Village Hall north of the A421. Residents living north of the A421 have the same problem when attempting to cross southwards to access the Post Office, All Saints Church and village schools located south of the A421.

3.3.2 Current Traffic Flow and Congestion Issues

The existing section of the A421 under consideration, from the A421 Bedford Southern Bypass roundabout to the A1 Black Cat Roundabout, north east of Roxton, comprises a single carriageway of both poor horizontal and vertical alignment and with a speed limit of 30 mph through the village of Great Barford.

The A421 trunk road through the village of Great Barford carries some 18,500 vehicles per day (vpd), of which about 14% is heavy goods. Immediately to the west of Great Barford, this figure increases to more than 20,500 vpd. Further west, towards the junction with the Bedford Southern Bypass, the figure rises to 24,400 vpd. The reason for these differences is, firstly, the fact that much of the traffic on the A421 originates from or is destined for the Bedford area to the west. Secondly, some of the traffic turns on or off the A421 at Great Barford on to the minor roads crossing the A421. These flows are illustrated overleaf.

To the east of Great Barford, between Great Barford and Roxton, the flow is 19,600 vpd. Again, this slightly higher than in Great Barford itself, because of diversion on to minor roads around Great Barford.

Up to 90% of this traffic is through traffic, the remainder being local. In the morning and evening peak hours, there is a significant volume of commuting, mostly in and out of Bedford. The route is subject to congestion at key junctions – in particular at the A1/A421 Black Cat Roundabout - for extended periods in the morning and evening peaks.

On the length of A421 to be bypassed, accident data for 1997 to 1999 inclusive shows a total of 41 casualties over 3 years (32 slight, 8 serious and 1 fatal). Accidents occurred over the whole of this length, with the largest concentration near the Black Cat junction.

3.3.3 Air Quality

Background air quality in the rural Great Barford area is good. However, air quality along the A421 corridor is subject to the effects of vehicle exhaust emissions, resulting in high levels of particulate matter and nitrogen dioxide.

Figure 4 shows the location of receptors considered in the DMRB Local Air Quality Assessment.

3.3.4 Traffic Noise Levels

(a) Brief Explanation of the Nature and Measurement of Noise

The sound wave travelling through the air is a regular disturbance in atmospheric pressure. These pressure fluctuations are detected by the human ear when within the audible range, producing the sensation of hearing.

Noise is often defined as sound that is undesired by the recipient. For the present purposes it is taken to be the perceived sound emitted by road traffic or other sources near the site of the proposed road improvements.

It is impossible to measure nuisance caused by noise directly, but it is possible to measure the loudness of that noise. "Loudness" is related to both sound pressure and frequency, both of which can be measured. The human ear is sensitive to a wide range of sound levels. The sound pressure level of the threshold of pain is over a million times that of the quietest audible sound. In order to reduce the relative magnitude of the numbers involved, a logarithmic scale of decibels (dB) based on a reference level of the lowest audible sound is normally used.

The response of the human ear is not constant over all frequencies. It is, therefore, usual to weight the measured frequencies to approximate the human response. This is achieved by using an "A" weighted decibel reading dB(A) and has been shown to correlate closely to the human response.

When measuring traffic noise, the instantaneous noise level is constantly changing due to variation in the traffic flow and vehicle composition. To obtain a single representative figure for traffic noise it is normal to adopt the level that is exceeded for 10% of the time. This is known as the L_{10} noise level. To depict the noise levels experienced throughout the day the hourly L_{10} noise levels are averaged over the 18 hour period from 06.00 - 24.00 on a normal working day. This is referred to as the L_{10} (18-hour) noise level.

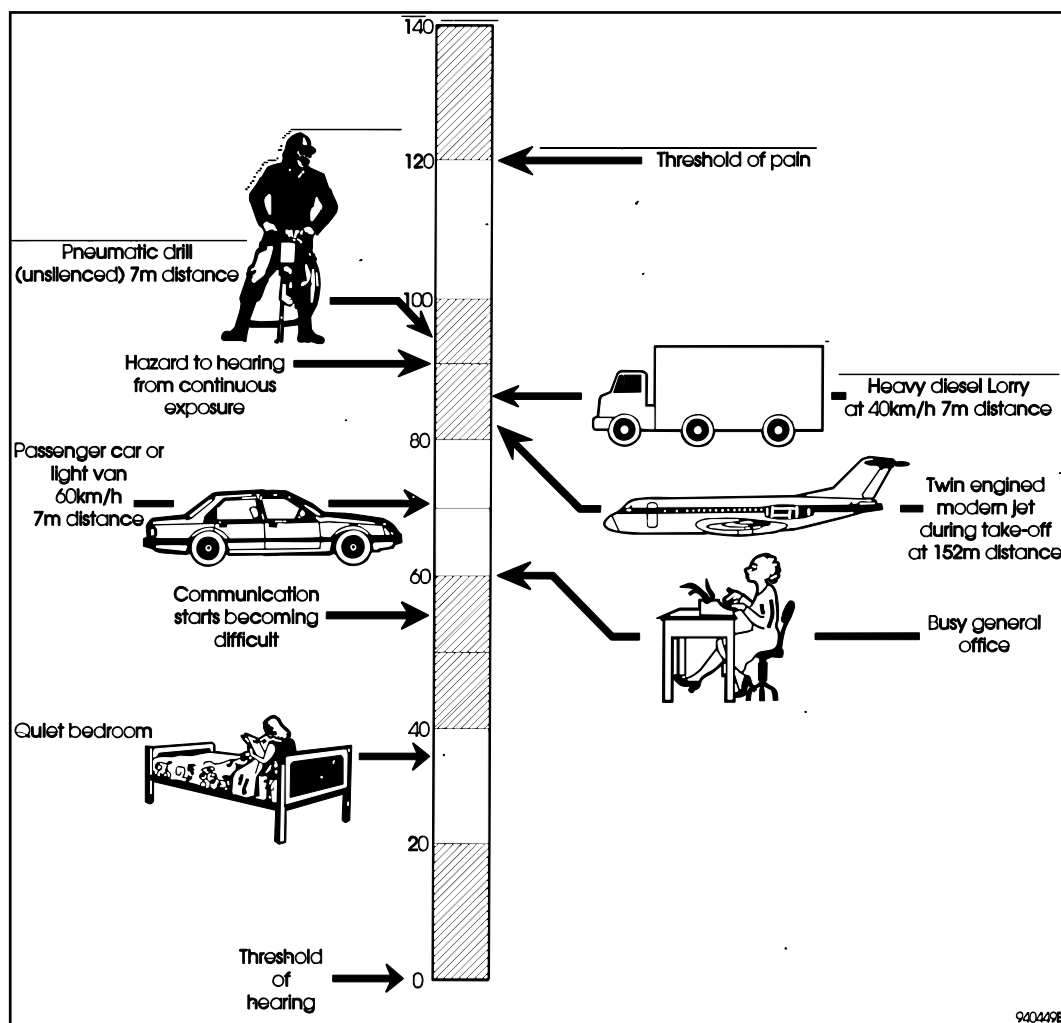
When related to perceived changes in noise, a change of 10 decibels from say 60 dB(A) to 70 dB(A) would represent a doubling in "loudness". It is also useful to note that traffic noise level changes of less than 3 dB(A) cannot normally be perceived by the human ear.

Equivalent Continuous Sound Level (L_{Aeq}) is the level of a Notional Steady Sound which at the same position and over a defined period of time, would have the same "A"-weighted acoustic energy as the fluctuating noise. The unit is mainly used in connection with construction noise rather than traffic noise.

Free field is where sound is measured or calculated in the open, without any reflection from nearby surfaces. Facade level is the effect of reflection, which produces a higher level. In the case of a building, the sound level close to it, at 1 metre from the walls is slightly higher (2.5 dB(A)) than would be if the buildings were not there.

Box 1 below illustrates different sounds as measured on the dB(A) scale.

Box 1 The Level of Typical Common Sounds on the dB(A) Scale



(b) Baseline Noise Levels in the Great Barford Area

The results of a noise survey carried out on 13th-14th July 2000 at various locations in the Great Barford area are summarised in Table 3-A. These locations are shown in Figures 19-29. Results are presented in terms of “A” weighted decibel readings, designed to correlate most closely to the human response.

As can be seen from Table 3-A, the baseline L_{Aeq} noise levels measured at properties in the vicinity of the existing A421 were in the range of 43.1 to 81.3dB. These are considered relatively high levels.

Location	Period (date)	Noise Level dB			
		L_{Aeq}	L_{A1}	L_{A10}	L_{A90}
Lay-by opposite Barford Lodge 2.5m from road. Free field.	09.08 - 09.23 (13.7.00)	81.3	89.0	85.0	66.4
	16.42 - 16.57 (13.7.00)	81.3	89.2	85.2	67.2
	09.53 - 10.08 (14.7.00)	80.6	88.8	84.8	60.0
Between 61 and 63 Chapel Field, free field.	09.48 - 10.03 (13.7.00)	43.1	53.6	45.4	36.2
Adjacent I Dothans Close, opposite 23 Chapel Field free field.	10.08 - 10.23 (13.7.00)	53.4	65.4	55.0	43.2
	11.17 - 11.32 (13.7.00)	51.4	62.6	53.2	42.6
	12.49 - 13.04 (13.7.00)	50.4	60.0	52.6	40.0
Green between 7 and 8 Dothans Close façade.	10.25 - 10.40 (13.7.00)	45.3	51.6	48.0	40.8
	15.59 - 16.14 (13.7.00)	46.5	52.6	48.8	43.0
Commercial Property “Mirror Span” façade, 1 metre from Bedford Road.	10.43 - 10.58 (13.7.00)	77.3	87.6	80.4	57.8
	14.12 - 14.27 (13.7.00)	76.7	86.4	79.8	57.2
	11.28 - 11.43 (14.7.00)	77.4	88.0	80.4	59.2
Lay-by 7 to 8 metres from carriageway to front of 50 Bedford Road free field	11.00 - 11.15 (13.7.00)	68.3	75.6	72.0	56.2
	12.32 - 12.47 (13.7.00)	68.1	75.6	71.6	56.8
	13.55 - 14.10 (13.7.00)	68.9	77.0	72.6	59.0
Pear Tree Cottage, Roxton 6 -7 metres from carriageway, façade	11.51 - 12.06 (13.7.00)	78.0	85.6	81.8	58.2
	13.17 - 13.32 (13.7.00)	77.5	85.2	82.0	57.2
	14.35 - 14.50 (13.7.00)	77.8	85.6	81.8	56.8
Opposite 26 Park Road, Roxton free field.	12.08 - 12.23 (13.7.00)	62.7	70.8	65.4	54.4
	13.34 - 13.49 (13.7.00)	60.8	69.0	63.8	53.0
	14.52 - 15.07 (13.7.00)	61.1	68.0	63.8	55.4
Opposite 7 Park Road, Roxton	14.08 - 14.23 (13.7.00)	58.0	69.8	58.0	51.2
Adjacent Great Dairy Farm, 10 to 12 metres from carriageway	15.38 - 15.53 (13.7.00)	72.8	79.4	76.2	62.6
	17.07 - 17.22 (13.7.00)	73.1	78.8	75.8	66.8
	10.18 - 10.33 (14.7.00)	72.4	79.2	76.0	61.8
Golden Cross Restaurant, Bedford Road 3 to 4 metres from carriageway façade.	10.43 - 10.58 (14.7.00)	73.4	81.6	76.8	59.4
	11.47 - 12.02 (14.7.00)	73.8	82.4	77.0	61.4
	12.03 - 12.18 (14.7.00)	73.7	81.4	77.4	60.4
Opposite 3 Green End Road free field.	11.00 - 11.15 (14.7.00)	62.2	74.2	61.8	49.4

Table 3-A Periodic Noise Monitoring Results

3.3.5 Driver Stress

The current A421 is a single carriageway road with journey speeds of 50-70 km/hr. Assessment according to tables in DMRB (reproduced in Section 5.11 of this report) produced a result of high driver stress, resulting from high speed and relatively high traffic volumes.

3.3.6 Cultural Heritage

Traffic congestion and the associated poor noise and air quality climate currently negatively affect the settings of four listed buildings within approximately 500m of the existing A421. Their relative locations to the existing road are described in the following table.

Name of Building	Approximate Distance from Existing A421
Ice House at Howbury Hall	500m north
Great Dairy Farmhouse	0m north
Cottage at Green End	500m north-west of Great Barford village centre
Roxton Park Lodge	0m east

Table 3-B Grade II Listed Buildings within 500m of the Existing A421

The location of these properties is shown in Figure 5.

Traffic congestion and the associated poor noise and air quality climate currently negatively affect the settings of 2 Scheduled Ancient Monuments (SAMs) within approximately 500m of the existing A421. Their relative locations to the existing road are described in the following table.

Name of SAM	Approximate Distance from Existing A421
Howbury Rings	0m south
Round Hill	250m north-west

Table 3-C SAMs within 500m of the Existing A421

The location of these SAMs is shown in Figure 5.

3.4 The Proposed Great Barford Bypass Route Corridor

The principal environmental issues of the proposed route corridor are related to the following, as described below.

- Land use
- Archaeology
- Ecology

3.4.1 Land Use

The majority of land throughout the proposed route corridor is MAFF Grade 2 – 3a agricultural land that supports arable crops. There is potential for the proposed scheme to conflict with local planning policies which generally aim to preserve such land. However, these planning policies are balanced by local and central government policies that promote road improvement, particularly “*A New Deal for Trunk Roads*” that makes specific mention of the A421 Great Barford Bypass.

3.4.2 Archaeology

Bedfordshire County Council holds information on known archaeological sites in the Great Barford area in the County Sites and Monuments Record.

Four known archaeological sites are located directly beneath the proposed route corridor. These are as follows:

- HER 16721: Cropmarks of a scatter of rectilinear enclosures, situated directly east of Water End Lane.
- HER 9833: Linear and rectilinear cropmarks additional to previously known findspot, situated north of Green End, in the vicinity of the Barford Road Overbridge area.
- HER 16769: Cropmarks of a rectilinear enclosure, south of High Barns Farm.
- HER 482: Additional linear cropmarks, situated between the access track to High Barns Farm and the existing A421 near Roxton.

Nine sites of potential archaeological significance were identified along the proposed route corridor during fieldwork conducted by Northamptonshire Archaeology during July – October 2001. The sites included a pit alignment, enclosure systems and possible kilns, as well as artefacts scatters dating from the early prehistoric to the medieval period. The full character and extent of the sites remains unknown and this is taken account of in the mitigation proposed (see Section 6).

3.4.3 Ecology

The proposed route corridor mainly comprises intensively managed arable land. Fields are large, with boundaries formed by species-poor hedges with numerous gaps. All of these habitats are considered of low ecological interest.

The principal area of ecological interest in the proposed route corridor is the eastern part of the parkland around Howbury Hall. This would be lost with the construction of the Water End Junction at the western end of the scheme. The area is considered to be of moderate ecological value due to the mature and semi-mature trees present.

Bats and badgers have been identified in some parts of the proposed route corridor and are discussed in separate confidential reports.

Measures to minimise effects on these features are described in section 6.

Ecological features are shown in Figure 7.

4.1 Scheme Description

The key components of the scheme comprise the following.

- A new Bypass, consisting of a 7.7km long all-purpose dual carriageway, with 120kph design speed, would commence at the eastern end of the Bedford Southern Bypass and finish at an enlarged Black Cat Roundabout on the A1 to the south of St Neots. The roundabout at the end of the Bedford Southern Bypass would be removed and a new grade separated junction would be constructed at Water End. There would be no other intermediate junctions.
- The Water End Junction would link the proposed Bypass with the A428 into Bedford to the west and the existing road to Great Barford to the east. These links would be all-purpose single carriageway roads, 7.3m wide with a 100kph design speed. The junction would be constructed at approximately ground level with the Bypass in a 5.5m deep cutting underneath. A new bridge would carry two 7.3m wide roads over the Bypass to connect two roundabouts forming a “dumb-bell” layout. The junction would provide for all traffic movements to and from the Bypass and grade separation would be effective in separating local traffic from long distance through traffic on the Bypass. A livestock underpass, beneath the link road to Bedford, would provide access for stock movements between the various areas of Howbury Hall land and an environmental bund would be constructed to the north of this link road to screen views of the Bypass from the Hall itself.
- At Chainage 2100 an underpass would be constructed to serve as a drainage culvert, a farm access for Brewers Hall Farm and allow users of Footpath 1 (Great Barford) to pass safely under the Bypass.
- Barford Road Bridge would carry Barford Road over the Bypass on approach embankments having a maximum height of approximately 2.6m above the existing ground level. The Bypass would be in cut approximately 5.6m deep.
- Birchfield Road Bridge would carry Birchfield Road over the Bypass on approach embankments having a maximum height of approximately 3.4m above existing ground level. The Bypass would be in a cutting approximately 5m deep.
- At Chainage 3500 an underpass would be constructed to serve as a drainage culvert and to allow users of Footpath 26 (Great Barford) to pass safely under the Bypass
- High Barns Bridge would carry the access road to High Barns and a diverted bridleway (BW6 Roxton) over the Bypass. The approach embankments would have a maximum height of 5.3m above existing ground level, while the Bypass would be in cut approximately 2.5m deep.

- Roxton Road would be re-aligned to reduce the severity of the existing bend north of the proposed Bypass and to avoid the need for skewed approaches to both the proposed overbridge and junction onto the existing A421. Approach embankments would have a maximum height of approximately 8.6m above existing ground level, while the Bypass would be approximately at existing ground level.
- Street lighting would be provided at the Water End Junction and the Black Cat Roundabout. The Bypass itself would not be lit.
- Footpaths and bridleways crossed by the Bypass would be diverted throughout the scheme with safe crossing points at overbridges or underpasses. The only at grade crossing would be at the Black Cat Roundabout, to ensure that the current provision is maintained.
- A safety fence would be provided for the central reserve and at certain locations in the verges, such as adjacent to bridge piers.
- Balancing ponds would be provided throughout the scheme to regulate water run off from the proposed Bypass discharging into the local watercourses.
- Landscape planting would be included to replace hedges and trees lost by the construction and help to blend the Bypass into the landscape.
- One set of lay-bys would be included in the scheme.
- Lighting at the junctions would be to British Standard 5489 Part 4, providing minimum illuminance to avoid unnecessary spillage to surrounding areas. Lighting columns would be 10 or 12m high, depending on the specification that would be adopted.
- In line with government policy, quieter road surfaces will be specified for the A421 Great Barford Bypass.

4.2 Environmental Barriers

The only defined environmental barrier to be installed as part of the scheme is the landscape bund proposed for Water End junction to mitigate visual and noise impacts in the eastern parkland at Howbury Hall.

4.3 Footways, Bridleways and Cycletracks

Five footpaths and one bridleway would be severed by the scheme. Alternative routes via underpasses and overbridges would be provided to mitigate for this. During the construction period, rights of way would be temporarily re-routed which may increase journey times for pedestrians, equestrians and cyclists using these routes.

4.4 Drainage

Nine balancing ponds are proposed along the length of the Bypass, at chainages 600, 1200, 1700, 3500 (two ponds), 4100, 6900 and 7600 (two ponds). These would control surface water runoff from the new Bypass. The ponds would be sized to control the rate of discharge for a 1 in 100 year return period storm to the current greenfield discharge rate.

Water from the balancing ponds would discharge into existing watercourses. A dip-plate structure and orifice would control the flow of water at each pond. This would restrict the discharge flows to existing (greenfield) runoff rates maintaining the existing conditions within the watercourses. The dip-plate structure would also provide a degree of protection from spillages.

4.5 Outline of Landscape Design

The proposed Bypass would pass through an area of contrasts in which the landscape character varies significantly on travelling west to east. The route commences in an area of parkland and lightly wooded valley progressing out onto open floodplain and extensive farmland. North east of Great Barford village, the route progresses through open farmland to join the A1. The local vegetation structure reflects the gradual transition from the small-scale arable and pastoral mix in the west through to the increasingly open arable pattern towards Roxton.

Throughout its western half, the alignment passes through an area of agricultural landscape in which landform is gently undulating with locally incised watercourses that follow a broadly north - south orientation. The Bypass crosses the grain of the landform and is cut into the higher agricultural plateau north of Great Barford. Where the road is in cutting and on short high embankments the objective has been to minimise the extent of the corridor rather than extend the width of the cut through the plateau.

Where the road is on low embankment and shallow cutting between Great Barford House and Black Cat there is a lack of relief in landform. Relaxation of side slopes to the earthworks would not have value in terms of integration of form and would rather serve to extend the influence of the road. There are therefore, no proposals to extend side slopes in these areas.

The proposals allow for relaxation of slopes at Howbury Hall to facilitate potential return to agricultural use and improve integration of the mound on the boundary. The proposals also allow for relaxation of slopes associated with the new Roxton Road overbridge utilising material derived from sections of the Bypass routed in cutting.

Particular attention is paid to the junctions and overbridges at Water End, Barford and Birchfield Roads, High Barns, Roxton Road and the Black Cat roundabout. Planting on the sections between junctions/overbridges would comprise a mix of dense stands of native species, related mainly to cuttings and groupings of intermittent trees and shrubs generally related to the severance of existing hedgerows.

There is a marked difference in the approach adopted west and east of Great Barford House. Proposed woodland, scrub and hedgerows provide a robust framework to the west where there is existing planting associated with Water End, a defined pattern of hedgerows and scrub contained along incised watercourses and drain lines. To the east proposed planting is generally sparse to avoid signposting of the route in an expansive landscape. There is a return to an enhanced planting structure east of Roxton Road where the arrangement of an overbridge, modified Black Cat roundabout and balancing ponds offer the opportunity for creating a localised but distinctive landscape feature at an important node in the local highway infrastructure.

Landscape Proposals are shown in Figures 8 - 18.

4.6 Construction Management and Maintenance

4.6.1 Construction Time Scale

Subject to the satisfactory completion of the statutory procedures, construction of the Great Barford Bypass could commence during 2004 with completion expected to take about 18 - 24 months.

4.6.2 Disruption to Traffic, Pedestrians, Equestrians and Cyclists

Construction along the majority of the route would occur in open agricultural land, resulting in minimal disruption effects to users of existing roads and rights of way. However, the main temporary disruption would be experienced by pedestrians, equestrians, cyclists and vehicle travellers at intersection points of the new Bypass with existing routes, listed below.

- The Water End grade separated junction.
- Barford Road overbridge.
- Birchfield Road overbridge.
- High Barns overbridge.
- Roxton Road overbridge and existing road realignment.
- The A1 Black Cat Roundabout.

These areas are shown on Figures 1 and 4.

4.6.3 Materials and Construction Traffic

During the construction phase, following the initial transport of plant and machinery into the construction site, construction traffic movements to and from the area being worked on would be expected to be as described in the following paragraphs, for each sequential phase of road construction. Exact movements cannot be predicted at this stage, as they would be dependent on the construction programme and working methods used by the successful Contractor.

(a) Earthworks and Off-site Disposal

It is envisaged that this component of construction would create the highest volume of traffic, due to the volumes of material involved. Approximately 120,000 to 150,000 cubic metres of the surplus material would be disposed of off-site during construction. Assuming that an average HGV carries a volume of 6 cubic meters, this would equate to between 20,000 and 25,000 HGV movements required to remove excess material. It is anticipated that these earthworks would be concentrated during the spring/summer of 2004, early in the construction period and during the most appropriate season. Therefore, assuming that the earthworks period lasts 26 weeks, this would equate to approximately 750 lorry movements per week, equivalent to 150 per working day. However, in reality, earthworks would take place during the whole of the 18 to 24 month construction period, so the movement frequency estimated is likely to represent a worst case scenario.

(b) Import of Materials for Sub-base, Blacktop, Concrete and Capping

The following volumes of materials are estimated to be required.

Material	Estimated Volume of material to be imported (cubic metres)
Sub-base	27,950
Blacktop	36,625
Concrete	3,005
Capping	80,000
TOTAL	147,580

Table 4-A *Estimated Volume of Construction Material to be Imported*

Assuming that an average HGV carries a volume of 6 cubic metres, this would equate to 25,000 HGV movements required to import construction material. Construction activity would be likely to be fairly spread out throughout the construction period. Therefore, assuming that the construction period lasts 100 weeks, this would equate to approximately 250 lorry movements per importing material, equivalent to 50 per working day. However, in reality, import of material would take place during the whole of the 18 to 24 month construction period, so the movement frequency estimated would be likely to represent a worst case scenario.

(c) Structures

Structures would be constructed principally at the Water End junction, Barford Road overbridge, Birchfield Road overbridge, High Barns overbridge and Roxton Road overbridge. These structures would be likely to be assembled from pre-cast components that would be brought to site by road, and there would be an associated requirement for provision of ready-mixed concrete. At the time of writing, it is not known precisely how the Contractor would phase this construction, so it is difficult to estimate the number of movements that would be generated in each of the areas being worked on at a given time.

The construction of carriageway areas would require the import of suitable granular fill as sub-bases. Again, at the time of writing, it is not known precisely how the Contractor would phase this element of construction, so it is difficult to estimate the number of movements generated in each of the areas being worked on at a given time.

4.6.4 Nuisance

The Contractor would be required to take various measures to minimise disruption and disturbance to local residents.

5.1 Introduction

This section provides a brief summary of the key environmental impacts of the proposed scheme, identified in accordance with Design Manual for Roads and Bridges (DMRB) Volume 11: Environmental Assessment⁹ (and subsequent updates) and Guidance on the Methodology for Multi Modal Studies¹⁰ (GOMMMS). The EIA assessment focuses on the environmental topics listed below. A full description of the methodology, baseline conditions, and detailed impact assessment appropriate to each topic covered is provided in the relevant stand-alone document in support of this Environmental Statement.

5.2 Traffic Flows and Accident Frequency

Traffic modelling and forecasting has been undertaken in accordance with central government guidelines to provide future year traffic flow forecasts for situations both with and without the proposed Bypass scheme. Under the high growth scenario, it is estimated that without the proposed Bypass, traffic levels in Great Barford in 2020 could rise by up to 27% above current levels, to 24,000 vehicles per day (vpd). The year 2020 is considered as it would be 15 years after opening, defined as the “design year”.

The effect of the proposed Bypass would be to remove the through traffic component. With the proposed Bypass and associated measures, traffic in Great Barford itself would be reduced to around 1,100 vpd in 2005. By 2020, this figure would be 2,000 vpd, respectively.

Accident savings from construction of the Bypass have been estimated for the trunk, principal and minor roads within the study area (consisting of the approximately triangular area between the A1/A421 Black Cat, A1/A603 Sandy and A421/A603 Cardington Cross. Over the 30 year design period of the proposed bypass scheme, there is estimated to be a saving of about 593 accidents, of which about 15 would be fatal and 103 would involve serious injury casualties.

5.3 Air Quality

Figure 4 shows the location of receptors considered in the DMRB Local Air Quality Assessment.

From an air quality perspective, the key activities related to the construction of the proposed Great Barford Bypass likely to create the greatest impact would be as follows:

- Dust Emissions from a variety of construction activities;
- Dust from HGVs or generated during off-site disposal of excavated material;
- HGV Haulage of construction material into the construction site.

A detailed construction schedule has not yet been established and without detailed knowledge of individual construction activities and timings, the following should be regarded as a preliminary assessment of the potential impacts.

⁹ HMSO. *Design Manual for Roads and Bridges. Volume 11: Environmental Assessment*. 1994.

¹⁰ HMSO. *Guidance on the Methodology for Multi Modal Studies (GOMMMS)*. 2000.

5.3.1 Construction Activities

Construction of the proposed scheme would involve the digging of foundations, bulk excavation, construction of embankments or tipping and vehicle movements on unsurfaced haul roads.

The main potential air quality impacts arising from such construction activities would be associated with fugitive dust emissions. However, the scale or impact of these can be generally variable in nature and be dependent on the type of constructional activity, ground conditions and meteorology at the time. A large proportion of dust from construction activities is usually caused by vehicle movements on unsurfaced haul roads. Dust can also be generated from uncovered stock piles and surplus spoil materials by wind erosion.

Prevailing low wind speeds will result in a high proportion of any entrained dust being deposited within a few hundred metres of the site. Consequently, because of the temporary nature of the construction activities, it is likely that the potential impacts would be in relation to dust deposition and potential nuisance in the immediate vicinity of the site rather than long term air quality (PM₁₀) concerns.

5.3.1.1 Off-site disposal of excavated material

During construction, surplus material from excavations of the MAFF Grade 2-3a agricultural land, mainly at Water End Junction, would be expected to be re-utilised within the construction area to create embankments and over bridges, principally at Barford Road, Birchfield Road, High Barns and Roxton Road. However, a surplus of such material is anticipated, which would need to be transported by road for disposal at one or more off-site locations.

At present, enquiries are being made with Bedford Borough Council and the Environment Agency as to the most appropriate site(s) that would accept this surplus material.

The off-site disposal of surplus material via road haulage has the potential to cause moderate levels of disruption, mainly due to increased lorry movements affecting traffic along the route to the disposal site. There would be an associated relatively minor air quality effect, from vehicle emissions and dust generation when loading/tipping, in the vicinity of the construction site. There is also the potential for wind blown dust and spillage from vehicles (e.g. mud on public roads) during the export of surplus material. However, the additional exhaust emissions from vehicles associated with the construction is likely to be small in comparison with the existing vehicle emissions and therefore it is unlikely that construction vehicle emissions would impact significantly on the local air quality.

5.3.1.2 HGV Haulage of material to and from site

There is the potential for wind blown dust and spillage from vehicles (e.g. mud on public roads) during the import or export of aggregate, rubble or soil materials. Vehicle exhaust emissions associated with construction traffic would also be released in the vicinity of the site although these would be unlikely to have a significant impact on local air quality.

Section 6.2 outlines proposed mitigation measures to reduce the potential dust deposition impacts from construction activities. Following mitigation, the significance of the overall air quality impact on the majority of local residential properties during construction and future decommissioning is likely to be minor adverse. There is the potential for some isolated properties, located within 200m of the construction site at the western and eastern limits of the proposed route, to be impacted to a higher degree.

5.3.2 Operational Period

With the Bypass scheme in place, for the majority of receptors considered, particularly those within Great Barford and on the fringe of Roxton, it is calculated that there will be substantial decreases in the pollutant concentrations compared to the situation without the Bypass in place. This trend is reflected at the worst affected property, the Hotel at Black Cat Services, although the level is still above the annual mean NO₂ Air Quality Strategy (AQS) Objective. At only two receptors, located close to either end of the scheme, there are predicted to be small increases in the pollutant concentrations.

No exceedences of the current or proposed AQS Objectives are predicted for the other pollutants considered, either with or without the scheme in place.

5.4 Cultural Heritage

The location of cultural heritage areas in the study area is shown on Figure 5 .

5.4.1 Archaeology

Excavation works and development of the Bypass route and associated structures have potential for significant disruption of any archaeological remains found below ground along the route. The extent of this effect would depend on the significance of the underlying archaeology.

The severing of archaeological sites would be potentially in conflict with Bedford Borough Local Plan policy BE23, which states that development upon archaeological sites is not allowed, unless the effects can be overcome.

5.4.2 Built Heritage

The majority of the listed buildings identified in the area of the proposed Bypass would not be expected to be directly materially affected by the proposed route, as they are sited more than 500m away from it.

Impacts on the character of these buildings during construction would mainly result from dust from construction and excavation works.

The proximity of the buildings to the construction area and to the new road location would influence the extent and significance of any effects. The closest building to the proposed route is Great Dairy Farmhouse, at approximately 50m. Distance of other buildings ranges from approximately 250m (for Roxton Park Lodge) to approximately 700m (for Cottage at Green End).

Therefore, the expected effects on the historic buildings are considered to be minor adverse.

5.4.3 Scheduled Ancient Monuments

The proposed bypass would be closer to Round Hill SAM than the existing A421. For Howbury Rings, the proposed route would be further away than the existing A421.

5.5 Disruption Due to Construction

The key activities related to the construction of the proposed Great Barford Bypass likely to create the greatest disruption would be as follows.

- Tie in to the existing roads at either end of the scheme.
- Temporary Diversion of Footpaths and Bridleways.
- Dust Emissions.
- Noise effects.
- Off-site disposal of excavated material during construction.
- HGV Haulage of construction material to the site.

5.6 Ecology and Nature Conservation

The effects of the proposed Bypass on the ecology and nature conservation of the area would be as follows.

- Permanent loss of approximately 3ha of parkland, including mature and semi-mature trees that are bat foraging areas, at the junction at the western end of the scheme, in the eastern parkland of Howbury Hall.
- Loss of approximately 44ha of intensively managed arable land of low ecological value.
- Loss of approximately 0.75km of immature species-poor hedges of low ecological value, mature species-poor hedges with gaps of low ecological value, or short tracts of mature species-rich hedgerows of low moderate ecological value, some of which are of historical importance under the Hedgerows Regulations, 1997.
- Loss of approximately 1ha of bat foraging area on the Howbury Hall / Water End Lane boundary and around the pond to the north-east of Great Dairy Farm. Any major disruption to the flyway corridor, such as the tree loss and junction construction proposed for this area, may interrupt the flyways of bats, limiting their available hunting grounds. However, this would be a temporary effect until planted areas matured to replace the corridor lost.
- Loss of two ponds at the Water End Junction location.
- Low potential for temporary increase in solid loading of the River Great Ouse in proximity of the route, resulting from earthworks for junction construction at the western end of the scheme.

Effects on badgers are discussed in a confidential report not to be placed in the public domain.

5.7 Landscape Effects

Landscape impacts and their effects related to each of the defined character zones are described below

(i) Character Zone A - Howbury Hall and Water End - Parkland

The magnitude of change would be high in an area of high sensitivity to change. Impact on local character would be substantial and adverse upon completion of construction and opening of the new road. Once proposed mass planting introduced as part of the landscape strategy establishes and begins to mature the severity of impact would begin to diminish but would remain substantial and adverse.

(ii) Character Zone B - Bedford Southern Bypass to Cuckoo Bridge - Disturbed River Valley and Floodplain

The magnitude of change would be low within a landscape of low sensitivity to change. The resultant impact on the disturbed landscape of the valley floor and on the contained landscapes of Howbury Rings, Lee Wind and Water End Cottages would be slight and adverse upon completion of construction reducing to neutral as the new hedgerows establish and mature.

(iii) Character Zone C - Water End Road to Birchfield Farm / Great Barford House -Rolling farmland with intermittent hedgerows

It is a landscape of ordinary quality and medium sensitivity to change. The magnitude of change would be medium. Impact would be moderate and adverse on construction reducing to slight as planting proposals establish.

(iv) Character Zone D - Cuckoo Bridge to Great Barford - Shallow Valley and Floodplain

Impacts would be neutral upon completion of construction and in the assessment year.

(v) Character Zone E - Great Barford Village - Village

There would be slight adverse impact on the northern margins of Green End reducing to neutral 15 years after scheme opening. There would be moderate beneficial impact associated with the relief of heavily disruptive activity on the existing road as it passes through the village. Impacts would generally be slight and beneficial both upon completion of construction and on opening of the Bypass.

(vi) Character Zone F - Great Barford House - Parkland/Estate

Impacts upon completion of construction and 15 years after scheme opening would be slight and beneficial.

(vii) Character Zone G - Great Barford House to Black Cat - Extensive farmland with dispersed and sparse planting

The magnitude of change in a landscape of ordinary quality and low sensitivity to change would be medium to high. The nature of the change would be a combination of beneficial and adverse. Impact at the year of opening would be slight and adverse and would remain so 15 years after opening.

(viii) Character Zone H - Roxton Village - Village and Parkland

Impacts would be neutral upon completion of construction and 15 years after opening

(ix) Character Zone I Great Ouse east of Great Barford to Black Cat – River Floodplain

Impacts would be neutral upon completion of construction and 15 years after opening.

5.7.2 Summary of Impact Ratings

The assessment has identified nine key character zones. Impacts and residual effects are summarised in the table below.

Character Zone	Impact Ratings	
	Winter Year of Scheme Opening	15 Years After Scheme Opening
A	Substantial Adverse	Substantial Adverse
B	Slight Adverse	Neutral
C	Moderate Adverse	Slight Adverse
D	Neutral	Neutral
E	Slight Beneficial	Slight Beneficial
F	Slight Beneficial	Slight Beneficial
G	Slight Adverse	Slight Adverse
H	Neutral	Neutral
I	Neutral	Neutral

Table 5-A Summary of Landscape Effects

5.8 Visual Impacts

The following table summarises the broad implications for receptors.

Area	Key Features with Implications for Receptors	Summary of Impact
Water End and Renhold	Grade-separated junction with its associated lighting and signage and the alignment of the road to the north-east across open agricultural land	<p>Impact would be greatest during construction and would be substantial for all but three of the properties east of Howbury Rings and for Brewer's Hall Farm.</p> <p>Impacts on completion of construction, at scheme opening, would have changed as follows.</p> <ul style="list-style-type: none"> • Receptors experiencing substantial construction impacts would have generally reduced to moderate. • Properties east of Howbury Rings would have reduced to slight or neutral. • Brewer's Hall Farm would have reduced to slight. <p>Upon establishment of the landscape proposals fifteen years post construction, impacts would generally be as follows.</p> <ul style="list-style-type: none"> • Moderate for receptors north of the new junction. • Slight to neutral for those receptors south of the new junction. • Slight for Brewer's Hall Farm. • For two receptors, Lee Wind and Water End Cottages, slight and beneficial.
North of Green End	Routing of the road on embankment across small watercourses and in cutting through the crest of the plateau above Green End, and the two overbridges on Barford Road and Birchfield Road.	<p>Impact would be greatest during construction and would be substantial for Little Birchfield Farm and the terraced housing on Barford Road in Green End. It would be moderate for other property on Birchfield Road and Barford Road other than for Greened Farm where impact would be slight. All other receptors would be subject to slight impact.</p> <p>Impacts on completion of construction at scheme opening would have changed as follows:</p> <ul style="list-style-type: none"> • Receptors experiencing substantial construction impacts would have generally reduced to moderate. • Those experiencing moderate construction impacts would have reduced to slight or neutral other than for Northfield Farm which would remain moderate. • Those experiencing slight construction impacts would remain slight or reduce to neutral. <p>Upon establishment of the landscape proposals fifteen years post construction impacts would generally be slight to neutral for all receptors other than 36 Birchfield Road which would be subject to slight beneficial impact.</p>

Table 5-B Summary of Visual Impacts

Table 5-B Summary of Visual Impacts(continued)

Area	Key Features with Implications for Receptors	Summary of Impact
Birchfield Road to High Barns	Routing of the Bypass across an extensive agricultural landscape via a combination of low embankment and shallow cutting and the introduction of an overbridge to maintain access to High Barns	<p>Impact would be greatest during construction and would be substantial for three of four receptors at High Barns, and the Bungalow. It would be moderate for the fourth receptor at High Barns and Hill Farm and slight for the remaining two located south on the existing road and Great Barford House.</p> <p>Impacts on completion of construction at scheme opening would have changed as follows:</p> <ul style="list-style-type: none"> • Receptors experiencing substantial construction impacts at High Barns would continue to experience substantial impact whilst The Bungalow would have reduced to moderate. • Hill Farm would continue to experience moderate impact. • Those experiencing slight construction impacts would remain slight. <p>Upon establishment of the landscape proposals fifteen years post construction impacts would generally be:</p> <ul style="list-style-type: none"> • Moderate to slight for receptors north of the new Bypass and The Bungalow. • Slight to neutral for other receptors south of the new Bypass.
Black Cat, Roxton and Chawston	A new and enlarged roundabout at Black Cat and its associated lighting and signage, the alignment of the Bypass north of the existing road and the alignment and elevation of Roxton Road over the Bypass to the east of the existing side road alignment.	<p>Impacts for residential and business properties would be most significant during construction when heavy engineering plant operations would add to the visual disruption that the existing A1 and A421 already bring to the area. The highest order of impact would be for property located close to the Black Cat Roundabout and the terrace of housing north-west of the A421 and west of Roxton. For housing to the north along the A1 construction impacts would be slight whilst for property on the western edge of Roxton and on Spinney Road to the south of Chawston the impacts would be slight to moderate.</p> <p>Impacts on completion of construction at scheme opening would have changed as follows:</p> <ul style="list-style-type: none"> • Receptors experiencing high construction impacts would have generally reduced to moderate. • Those experiencing moderate construction impacts would have generally reduced to slight. • Those experiencing slight construction impact would have generally remained slight or reduced to neutral. Those west of Roxton would have changed to slight and beneficial. <p>Upon establishment of the landscape proposals fifteen years post construction impacts for all receptors would have reduced to slight or neutral or changed to slight and beneficial.</p>

Table 5-B Summary of Visual Impacts(continued)

Area	Key Features with Implications for Receptors	Summary of Impact
Footpaths, Bridleways and Open Spaces	Routing of the Bypass in cutting north of the village and the two overbridges on Barford and Birchfield Roads.	<p>Impacts would be substantial for those that are crossed by the Bypass and that would be routed via underpasses. Whilst there would some mitigation provided by the landscape proposals, the longer-term impact would be of a moderate order.</p> <p>The key features of the proposed Bypass with implications for receptors using paths and bridleways between Chawston and Roxton relate to the new overbridge on Roxton Road and the new Black Cat Roundabout. Whilst the new Bypass would be routed further north the impact of the existing A421 and A1 on local rights of way is such that there would not be a marked change in impact related to traffic in the area. The proposals for a substantial landscape framework as part of the road proposal at this eastern end would bring benefit to the local visual context and to many of the users of the rights of way.</p> <p>The key feature with implications for users of Howbury Hall Parkland is the new Water End Junction. Substantial impacts during construction would reduce to neutral once the proposed screening bund is introduced in the north-west sector of the junction and change to slight and beneficial as planting on the outer face of the bund establishes.</p> <p>For users of Roxton Cricket Ground impacts during construction would be high reducing to slight and beneficial as existing traffic on the A421 is displaced to the north.</p>

5.8.1 Summary of Impacts on Buildings

The table below indicates that with mitigation measures in place and established there would be no substantial visual impacts for properties within the road corridor.

	Impacts	Number of Properties	Number of Properties
		Winter Year of Opening	Summer 15 Years After Opening
Adverse	Substantial	6	0
	Moderate	17	7
	Slight	20	8
No Change		12	29
Beneficial	Slight	5	15
	Moderate	0	1
Totals		60	60

Table 5-C Summary of Impacts on Buildings

5.8.2 Summary of Impacts on users of Footpaths, Bridleways and Open Spaces

The table below indicates that with mitigation measures in place and established there would be no substantial visual impacts for users of local rights of way and open spaces.

	Impacts	Number of Properties	Number of Properties
		Winter Year of Opening	Summer 15 Years After Opening
Adverse	Substantial	0	0
	Moderate	5	2
	Slight	7	5
No Change		6	4
Beneficial	Slight	1	8
Totals		19	19

Table 5-D Summary of Impacts on Users of Footpaths and Bridleways

5.9 Traffic Noise and Vibration

The assessment was conducted based on three potential scenarios: the “Do Nothing” scenario, in which no road construction would be undertaken; the “Do Minimum” scenario which involves undertaking maintenance on the existing A421 and the “Do Something” scenario, which would involve the construction of the proposed Bypass. Noise study predictions are depicted on Figures 19 – 29.

- Modelling results of the “Do Something” scenario suggest that the Bypass scheme would provide noise relief to 144 properties, which would experience a decrease in noise of 3dB(A) or more.
- With the scheme in place, 8 residential properties would experience an increase in noise level of 3dB(A) or more.
- Without the scheme, 112 residential properties would be subjected to an increase in traffic noise of less than 3dB(A) by 2020, with 2 properties subject to an increase of 3-5dB(A).
- Comparing the “do nothing” option with the proposal option and the “do minimum” option for 15 years following scheme opening, 6 properties are higher with proposal and 144 higher with the do minimum situation. Only 3dB changes considered. This is a net benefit of 138 properties.
- No properties are likely to be eligible for noise insulation due to increased traffic noise. In addition no properties are likely to require insulation against construction noise.

It is not considered that traffic vibration, with reference to damage due to buildings, would be a problem. With the scheme in place, numbers bothered by traffic vibration would increase at 2 residential properties and decrease at 134 residential properties.

5.10 Pedestrians, Cyclists, Equestrians and Community Effects

The scheme would lead to both positive and negative effects on pedestrians, cyclists, equestrians and the community, listed below. The assessment identifies that the proposed scheme produced an overall positive effect.

5.10.1 Positive Effects

Expected positive effects would include the following.

- Permanent removal of through traffic on the A421, and hence an improvement in safety, that would result from the removal of the traffic flows from the crossings, and reduction in the need for existing informal and dangerous crossing movements for pedestrians and others.
- Permanent reduction in congestion along the A421 that would result in a related improvement in air quality and reduced traffic noise levels for local communities in the areas of Roxton and Great Barford.
- Improved community connectivity due to the removal of through traffic from the route that bisects Great Barford.

5.10.2 Negative Effects

Negative effects expected from the development of the Bypass would include the following.

- During the construction period, temporary diversion of rights of way would result in slightly longer routes for pedestrians, cyclists and equestrians, and would cause disruption to users until they became familiar with the diversion routes.

5.11 Vehicle travellers

5.11.1 View from the Road

Where the proposed route is in cutting, flanked by sloping embankments, the view of the traveller would be restricted. When the road levels out, the view would be of the open countryside, principally agricultural land, with small villages in the distance on either side.

The quality of the view that would be visible from the road may be classed as high quality, with considerable amounts of agricultural land flanking each side of the proposed route.

5.11.2 Driver Stress

The proposed Bypass would operate in the context of increased nationwide traffic levels, but one in which there would be a distinctive segregation between traffic for the Bypass and traffic for the local villages.

The following tables are reproduced from DMRB Volume 11 Section 3, Part 9, Chapter 4 – Assessing Driver Stress.

Table 5-E refers to the existing situation, a single-carriageway road. Current (year 2000) traffic flows for the A421 between Water End and Black Cat are between 18,500 and 24,400 vehicles per day, equivalent to around 385 – 508 vehicles per lane per hour. As can be seen, the table shows that for average journey speeds of 50-70 km/hr, driver stress is high with these flows. With the proposed Bypass in place, traffic flows along the existing A421 between Water End and Black Cat would be reduced to between 23 and 33 vehicles per lane per hour, equivalent to low to moderate driver stress according to Table 5-D, depending on the average journey speed. Table 5-F refers to driver stress for the proposed situation of a dual carriageway with peak hourly flows of 0 - 1600. For predicted Bypass traffic levels of between 21,500 and 27,000 vehicles per day, equivalent to approximately 448 – 563 vehicles per lane per hour, driver stress is then categorised as low for an average journey speed of over 80 km/hr.

Average peak hourly flow per lane, in flow units/1 hour	Average Journey Speed km/hr		
	Under 50	50-70	Over 70
Under 600	High	Moderate	Low
600-800	High	Moderate	Moderate
Over 800	High	High	High

Table 5-E Driver Stress on Single Carriageway Roads. From DMRB Volume 11, S3, Part 9

Average peak hourly flow per lane, in flow units/1 hour	Average Journey Speed km/hr		
	Under 60	60-80	Over 80
Under 1200	High	Moderate	Low
1200-1600	High	Moderate	Moderate
Over 1600	High	High	High

Table 5-F Driver Stress on Dual Carriageway Roads. From DMRB Volume 11, S3, Part 9

Therefore, using the assessment guidance from DMRB shown in Tables 5-E and 5-F above, driver stress levels would be reduced from a high to low or moderate level with the introduction of the new Bypass.

5.12 Water Quality and Drainage

Potential impacts upon the existing water quality in terms of groundwater and minor watercourses are possible throughout the construction and operational period of the proposed Bypass. A number of minor watercourses would be crossed during the construction. Additionally there would be loss of two existing ponds at the Water End Junction of the Bypass. Potential impacts are listed below for both construction and post construction phases of the Bypass.

5.12.1 Construction

The potential impacts upon water quality and drainage during the construction phase would be:

- High levels of suspended solids in minor watercourses.
- Pollution of ground water due to spillages of toxic substance.

During the construction phase, the water environment would be at risk from a number of activities, as listed in Table 5-G.

Activity	Details
Use of plant	Small spillage of fuel and/or oil Contamination from washing of plant
Storage of fuels/oils	Spillage from storage containers
Storage & use of construction materials	Disposal of construction waste materials Pollution of surface runoff from aggregates and other materials
Structures	Concrete liquors draining to existing water course or groundwater Concrete spillage into existing watercourse
Earthworks	Sediment laden runoff Blockage of existing watercourses

Table 5-G Construction Activities with Potential Risks to Water Quality Resources

5.12.2 Post construction

The surface water runoff from the highway would eventually drain into balancing ponds situated before discharging into water courses in a controlled manner.

Pollutants likely to be found within surface water runoff from the highways are as follows in Table 5-H.

Activity	Details
Vehicle Emissions	Hydrocarbons, petrol, diesel, oils, and hydraulic fluids
De icing Chemicals	Salts
Control of vegetation	Pesticides
Accidental spillages	Metals, (lead, cadmium, zinc, etc)
Other activities	Illegal dumping, agricultural works

Table 5-H Post Construction Usage with Potential Risks to Water Quality Resources

Levels of contaminants would be governed by the volumes of traffic generated by the new highway and the runoff from the impermeable area.

5.13 Geology and Soils

Analysis of the gathered information confirms that no geological or geomorphological features within the study area have been designated as Sites of Special Scientific Interest (SSSI) or Regionally Important Geological Sites (RIGS). There is no evidence of any sites of geological interest that would be affected by the construction of cuttings and embankments.

The principal impacts of the proposed route on topography are related to the proposed earthworks.

A slope stability analysis and report on a survey of slope conditions on motorway earthworks in England and Wales indicates that side slopes at an angle of 1 in 3 would be required for both cuttings and embankments in these materials to ensure adequate stability.

The ground investigation data indicates a thickness of the existing topsoil of 0.2m to 0.4m. The exiting topsoil would be stripped off and stockpiled during construction for reuse in landscaping. The thickness of topsoil placed on the slopes of the proposed cuttings and embankments would be approximately 0.15m to 0.2m and with the slope angles of 1 in 3 it is considered to be stable.

To ensure stability of new cuttings and embankments, drainage measures would be incorporated. These measures would include for surface water control, reduction in pore water pressures and control of seepage from the slope face where appropriate.

The ground investigation data indicates that with the exception of the balancing ponds located off Roxton Road and Black Cat Roundabout, relatively impermeable strata comprising Alluvial clays and predominately cohesive Glacial Till are present at the location of the proposed balancing ponds. These materials will have low soil infiltration rates.

From the reviewed geological information there is no evidence to indicate that the route would have any significant impact on groundwater flow or locally important aquifers.

There is no evidence of widespread mineral workings in the area 100m either side of the route central line. The gravel mineral associated with the River Ouse terraces is a small and discontinuous deposit with the limited occurrence along the proposed route.

There is no evidence to indicate widespread land filling and any ground or groundwater contamination in the areas under consideration on the basis of the detailed ground investigation. With the exception of the alluvial clays the excavated material would be suitable for reuse in the embankments construction.

5.14 Policies and Plans

The Great Barford Bypass scheme is generally in accord with various national, regional and local policies in force, particularly “*A New Deal for Trunk Roads*” as detailed below.

5.14.1 “A New Deal for Trunk Roads”

The Great Barford Bypass is included in the schemes listed in the Targeted Programme of Improvements within this White Paper, as it “*will provide a safer and healthier environment for Great Barford by removing 75% of traffic and eliminate a bottleneck on the core route from Milton Keynes to Cambridge*”.

5.14.2 “A New Deal for Transport: Better for Everyone”

Table 5-I demonstrates how the proposed Great Barford Bypass conforms with some of the key aspirations detailed in the White Paper.

Key Aspiration	Conformity of Proposed Great Barford Bypass
<i>cleaner air to breathe by tackling traffic fumes</i>	Removal of through traffic from Great Bardford village improving air quality for local residents.
<i>increasing prosperity backed by a modern transport system</i>	Provision of a dual carriageway with 70 mph design speed would decrease congestion for road users.
<i>reduced rural isolation by connecting people with services and increasing mobility</i>	Existing routes of footpaths and bridleways would be maintained or slightly diverted. Removal of through traffic from Great Barford presents greater opportunities for re-unifying the community currently bisected by the A421.
<i>easier and safer to walk and cycle</i>	Removal of through traffic from Great Barford village would decrease the likelihood of accidents for pedestrians and cyclists.
<i>tackling the 'pinch-points in transport networks that lead to congestion</i>	Current A421 through Great Barford becomes congested due to the 30mph speed restriction in force through the village and volume of traffic passing through.
<i>better interchanges</i>	The A1/A421 Black Cat Roundabout would be revised and the A421/A421 Water End junction would be revised.
<i>less congestion on our roads</i>	Provision of a dual carriageway with 70 mph design speed would decrease congestion for road users.
<i>Tackling transport noise</i>	Removal of through traffic from Great Barford village decreasing ambient noise levels experienced by local residents.
<i>less damage to roads and the environment through greater use of 6 axle lorries and keeping unsuitable lorries off unsuitable roads</i>	The proposed Great Barford Bypass would remove lorry traffic from the existing poor condition single carriageway A421 to a more suitable new dual carriageway.
<i>decision-making on transport to be more accountable to local people</i>	There would be public exhibitions of the proposals.
<i>improve reliability for journeys in all modes, helping to support business and economic growth</i>	Removal of through traffic and congestion from Great Barford village would improve journey reliability.
<i>Improve links with international markets</i>	The A421 Great Barford Bypass is part of a key freight route from the Midlands to the east coast shipping terminals.
<i>protect habitats and maintain the variety of wildlife</i>	Ecological assessment shows minimal impacts on wildlife and habitats with suitable mitigation in place.
<i>promote carefully targeted capacity improvements to address congestion on the network, where they support our integrated transport policy</i>	A421 Great Barford Bypass is a carefully targeted capacity improvement.
<i>For all environmentally sensitive areas or sites there will be a strong presumption against new or expanded transport infrastructure which would significantly affect such sites or important species, habitats or landscapes.</i>	No such areas are affected by the proposed Great Barford Bypass.

Table 5-1 Key Aspirations of A New Deal for Transport: Better for Everyone

5.14.3 “Transport 2010 – A Ten Year Plan”

This document was a follow-up to *A New Deal for Transport: Better for Everyone*, detailing the level of investment proposed, and again makes specific reference to the Great Barford Bypass as a one of the key trunk road improvement schemes.

5.14.4 Planning Policy Guidance Notes (PPGs)

PPG 13 – Transport is in accordance with *A New Deal for Transport: Better for Everyone* and *Transport 2010 – A Ten Year Plan*, with Annex C making specific reference to the environmental impact of road schemes and the need to accord with DMRB Volume 11.

5.15 Regional and Local Policies

5.15.1 Regional Planning Guidance (RPG 9), March 2001

RPG 9 – Transport is in accordance with *A New Deal for Transport: Better for Everyone* and *Transport 2010 – A Ten Year Plan*, making specific reference to these policies in paragraphs 9.31 - 9.33, and so includes the A421 Great Barford Bypass. It states that the planned start of works for the scheme is 2005.

5.15.2 Bedfordshire Structure Plan 2011

As with all developments, the Great Barford Bypass has the potential to conflict or conform with policies listed in the Bedfordshire Structure Plan 2011. However, based on the review undertaken, there is minimal conflict between the policies therein.

The principal conflict is with Policy 2 – Agricultural Land, as approximately 44ha of MAFF Grade 2 and 3a land would be lost to the scheme. However, this is balanced by Transport Policy 45 – New Infrastructure, as the Great Barford Bypass is specifically mentioned, and Transport Policy 37 – Integrated Transport, as Bedford/Kempston is a priority area for transport investment.

5.15.3 Local Transport Plan for Bedfordshire 2001-2 and 2005-6

Although the Great Barford Bypass would be a strategic regional scheme that comes under the auspices of the Government's Highways Agency, it would accord with some of the aspirations and programmed improvements at a county level mentioned in the LTP. For example, policies such as “*safer routes to school*” would be facilitated in the village of Great Barford due to the removal of through traffic. Also, schemes to improve walkways and cycle routes may tie-in with the rights of way mitigation proposed as part of the Great Barford Bypass.

5.15.4 Bedford Borough Council Local Plan Deposit Draft 1997 and Inspector's Report, April 2001

As with the Bedfordshire Structure Plan discussed above, the Great Barford Bypass has the potential to conflict or conform with policies listed therein. However, based on the review undertaken, there is minimal conflict.

The principal conflict is with Policy 26, relating to loss of high-grade agricultural land as approximately 44ha of MAFF Grade 2 and 3a land would be lost. In addition, the severing of archaeological sites is potentially in conflict with Bedford Borough Local Plan policy BE23. This states that development upon archaeological sites is not allowed, unless the effects can be overcome, although a “watching-brief” for archaeological remains during construction is proposed and would hopefully minimise any such effects.

5.15.5 Planning Applications

Only one planning application was identified as being within 100m of the proposed route, a proposed lorry park and ancillary facilities north of the existing Travelodge area on the Black Cat Roundabout. This area would not be materially affected by the scheme, but potential exists for conflict if the timing of Bypass construction coincides with the timing of development of the facility, which could lead to cumulative effects on traffic.

5.15.6 Tree Preservation Orders (TPOs)

No TPOs would be affected by the Bypass.

5.16 Land Use

Construction of the Great Barford Bypass would result in land take comprising MAFF Grade 2 and 3 agricultural land of approximately 44 ha. Agricultural Land Classification is shown in Figure 30.

Mitigation measures are summarised below.

6.1 Traffic Flow and Accident Frequency

The traffic assessment has showed that construction of the bypass would be the mitigation measure that would significantly decrease through traffic flow in the village of Great Barford resulting in an associated decrease in predicted accident rates.

6.2 Air Quality

6.2.1 Construction Period

Fugitive dust is the most likely area of potential impact during construction. Such dust emissions can be effectively controlled at source and can generally be avoided by good site practice.

Liaison with Bedford Borough Council prior to the start of construction would be undertaken to agree proposed working practices and environmental controls. This would be a key element in ensuring suitable and effective mitigation.

Based on these discussions, all Contractors would be required to work to a Code of Practice, which could include measures to minimise fugitive dust emissions, especially in the vicinity of potential receptors, particularly where there are domestic properties downwind.

6.2.2 Operational Period

The selection of the most appropriate Bypass route to avoid, as much as possible, populated areas was undertaken at an early stage in the design to minimise the operational impacts of the scheme.

6.3 Cultural Heritage

6.3.1 Archaeology

The potential presence of archaeological remains along the Bypass route would be addressed as follows:

- Consultation with the Bedfordshire County Council Archaeologist, to agree on nature and extent of measures to be adopted.
- Archaeological trial excavation at agreed locations along the route, to assess the nature, depth and level of "survival". This would be undertaken during Spring 2002.
- Watching briefs during construction works to photograph and record any findings identified.

6.3.2 Built Heritage

No specific mitigation measures would be required for the eight listed buildings within 500m of the route, given the limited significance of the impact expected. Designed landscaping around the Bypass junctions would limit the extent of any effects on the setting of the buildings.

Although situated within 100m of the proposed route, Howbury Rings and Round Hill Scheduled Ancient Monuments (SAMs) would not be materially affected by the Bypass. However, given their close proximity to the construction area, the Contractor would be required to erect, as a minimum, warning signage around these areas during the construction period, to prevent accidental encroachment of plant and machinery. Information to construction site staff regarding the protected nature of the SAM should also be provided. General measures to minimise environmental effects during construction would also apply.

6.4 Disruption Due to Construction

Disruption caused by the construction of the Bypass scheme would be minimal, as it is to take place on mostly agricultural land. The exception to this would be at the junction areas at either end of the route, where existing roads are located. Mitigation, in the form of temporary re-routing of rights of way and traffic management measures, would be provided.

6.5 Ecology and Nature Conservation

Mitigation measures that would be implemented to protect ecological and nature conservation resources along the proposed route are described below. Information specific to badgers is included in a separate confidential report.

- Landscaping vegetation would be planted throughout the scheme, particularly at the western end around Howbury Hall, to replace mature and semi-mature trees that would be lost during construction. Plantings would consist of native broad-leaved species of local provenance, to be established in a non-linear manner so as to create semi-natural woodland. Given the current low ecological value of the existing agricultural areas, such planting may go some way to develop wildlife corridors in the area, considered to be currently poor, and provide additional foraging habitats for birds and mammals (see also recommendations regarding bats below).
- No tree or scrub clearance would be undertaken during the bird breeding season of February to August inclusive in accordance with the Wildlife and Countryside Act, 1981.
- Trees felled for construction would be retained to create dead-wood habitat within newly planted areas.

- Nine balancing ponds are proposed at chainages 0600, 1200, 1700, 3500 (two ponds), 4100, 6900 and 7600 (two ponds). Although not proposed as specific mitigation measures for ecology, these areas present opportunities for wetland habitat creation, in the form of appropriate bankside profiling and vegetation planting attractive to wildlife. As wetland habitats in the study area were noted to be generally poor, with no evidence of protected amphibians, increasing the biodiversity value by appropriate planting of engineered ponds could be viewed as a positive enhancement.

As foraging bats have been detected in the Howbury Hall / Water End Lane area, suitable mitigation measures would be required to accommodate their foraging needs. All mitigation measures must be discussed with and agreed by English Nature in order to ensure that the Wildlife and Countryside Act, 1981 is not contravened. The following measures are a means of mitigation for the loss of bat foraging habitat.

- Bat boxes and a bat nursery could be provided to support existing populations. The boxes would be of specific dimensions and characteristics and their placement would be agreed with English Nature.
- Nine balancing ponds (see above) would be provided as part of the scheme and those having permanent standing water would replace the foraging habitat lost as part of the pond removed from the rear of Great Dairy Farm.
- Landscape planting at the eastern end of Howbury Hall would restore the lines of trees used by bats as routes to their foraging areas. As stated above, planting would consist of native species of local provenance established in a non-linear manner.

No specific mitigation measures are considered additional to the above for the operational phase of the scheme, apart from the necessary supervision of the Landscape Contractor in the short to medium term following initial planting (usually 1 - 3 years). Supervision would ensure that the following objectives are met:

- Any deficiencies or failures in the initial planting are replaced as necessary.
- Planting plots are successful.
- The desired planting density is achieved.

At this stage, no ecological monitoring is considered necessary based on the findings of this assessment.

6.6 Landscape Effects and Visual Impacts

Mitigation measures, in the form of the landscaping scheme proposed for the Great Barford Bypass, are summarised below.

The detailed landscape proposals are illustrated on Figures 6 to 16.

6.6.1 Water End Junction

The alignment of the bypass through Water End has been essentially determined by the termination of the Bedford Southern Bypass. The new grade separated junction has, however, been specifically located and configured to minimise the severity of impact that introduction of a large junction of this type potentially involves.

The utilisation of a single bridge with terminal roundabouts each side of the dual carriageway has enabled the extent of the plan form and scale of the provision for access and egress onto local roads to be reduced in plan form. The movement of the structure and roundabouts towards the north-east has enabled advantage to be taken of a dip in the existing landform and avoids elevation of the structure, roundabouts and new links onto local roads in a sensitive location. Close alignment of the westbound link road from the junction's northern roundabout to the top of the main line cutting has reduced the extent of intrusion into the existing parkland at Howbury Hall.

Earthworks proposals beyond those directly related to engineering of the junction involve the introduction of a mound along the new south-eastern boundary of the parkland at Howbury Hall. The outer face of the embankment would be graded to a slope of 1:3 and would be planted with a woodland mix to establish a strong woodland enclosure on the boundary tying into existing boundary planting west of Water End Road. The inner slope would be graded to 1:6 to establish a form sympathetic to the landform in the eastern section of the parkland and one that could be utilised for grazing should the land be returned to the holding.

The cutting slopes between the bypass and junction slip roads and the land between the eastbound off-slip and western link providing access back to Bedford would be planted with woodland planting. Additional land would be taken in the southern and eastern quadrants of the southern junction roundabout to complete the woodland planting enclosure from the south-west.

The embankments to both sides of the initial section of the bypass crossing the floodplain would be planted with scrub tying into woodland edge planting on the northern side that would framing the balancing pond.

Specimen tree planting would be introduced centrally to both roundabouts to provide a focus for approaching traffic.

Hedgerows including hedgerow trees are proposed:

- to link with existing planting on the east side of Water End Road following the northern boundary of the new link, framing the northern roundabout and returning down the boundary of the eastbound on slip to tie into a severed section of hedge as the slip road merges with the bypass.
- to both sides of the eastbound link from the junctions southern roundabout to the existing A421 and returning down the westbound off-slip as far as the balancing pond west of Brewer's Hall Farm.
- along the boundary of the westbound on-slip as far as the slip road merge with the bypass.

6.6.2 Water End to FP1

This section of the bypass crosses an open area of farmland with a broken pattern of hedges some of which are closely maintained whilst others have been allowed to grow out. The bypass would be on low embankment (1-1.5m). A balancing pond is located west of Brewer's Hall Farm on the eastern side of the bypass. The landscape proposals comprise hedges to both sides of the bypass to tie into existing hedges and reinforce the existing structure with trees at points where ditch lines and field boundaries are severed by the new road. Planting at the balancing pond would take the form of scrub along the southern, eastern and northern boundaries to link in with the hedges on the highway boundary.

6.6.3 FP1 to FP20

This section of the bypass involves the crossing of FP1 on a short, high embankment before the road enters deep cutting (6m) as it passes beneath the existing Barford and Birchfield Roads. The two side roads are elevated on low embankment (1.5 - 2m) to provide the required clearance. East of Birchfield Road the bypass emerges from cutting and crosses Birchfield Brook (and FP3) on high embankment allowing both brook and footpath to be routed beneath the bypass. It then severs FP20 as it returns close to existing levels. The footpath is diverted along the north side of the bypass to link up with FP7 and the proposed underpass. Balancing ponds are located south of the bypass adjacent to the underpasses at FP1 and FP3.

Landscape proposals comprise the introduction of woodland edge planting on the long cutting slopes with woodland at the crossing points for the two bridges. Embankment slopes would be planted with woodland and scrub to soften the form of the earthworks and tie into existing scrub in the shallow valleys crossed by the road. Similarly the short embankment slopes at the side road crossovers would be planted with scrub to soften but not overly accentuate these points in the open landscape above Green End.

Scrub planting would be used to enclose the balancing ponds and tie into the shallow valleys containing the watercourses that act as discharge points for the ponds.

The alignment would result in severance of a small triangular plot that currently forms part of a large field that extends north towards Birchfield Farm. The plot is included in the CPO on the basis that it would enhance integration of the adjacent embankments.

The following hedges would be planted:

- a short length to link scrub planting associated with the balancing pond at FP3 with an existing hedge defining the severed plot to be planted with woodland.
- a section north of the bypass between FP3 and FP20 enclosing a redirected drain and the realigned footpath.

6.6.4 FP20 to Roxton Road

This section of the bypass crosses an open extensively farmed landscape in which fields have been enlarged, remnant boundary hedges are few and the principal planting comprises a number of dispersed formal plantations. The bypass is initially on low embankment as it passes north of Great Barford House Conservation Area and continues in shallow cutting (1.5-2m) as it curves and runs parallel to the existing road east of High Barns and west of Roxton Park. Access to High Barns is maintained by the introduction of an overpass along the line of the existing access to the farm buildings.

There are no distinctive landscape features and no coherent planting structure within the area. Where hedges are severed, north west of Great Barford House, intermittent planting is proposed within the bypass boundaries to provide a visual link between severed sections. The alignment also severs a small triangle of land at the northern end of the Hill Farm holding. This land and a 10m wide strip of land south of the bypass is to be taken and planted with mixed plantation to mitigate impact at the point closest to the Conservation Area.

The remainder of the section would generally be left open with occasional groupings of specimen trees and scrub planted to the south of the bypass to frame the proposed lay-by north of the Bungalow.

Woodland edge planting would be planted on the embankments supporting the bridge over the bypass providing access to High Barns with specimen trees each side of the access at its junction with the existing A421.

A new block of mixed planting would be planted to the north of the terrace of houses opposite Roxton Park utilising a strip of land that extends the width of the terrace and to the bypass boundary.

6.6.5 Roxton Road to Black Cat

The key component of the proposed bypass in this section comprise a new and prominent overbridge to carry Roxton Road over the bypass. The bypass would be in shallow cutting and the approach roads and bridge would be on a new alignment east of the existing road and an existing triangle of land enclosed by tree planting. A balancing pond would be located within the enclosed triangle of land. The eastern end of the bypass is on shallow embankment as it ties into an enlarged, reconfigured and relocated Black Cat Roundabout. A new section of road linking the existing trunk road adjacent to the Garden Centre with the new roundabout is also to be constructed. Two balancing ponds are to be located around the newly aligned section of the A421 and the bypass.

The objective is to establish a robust landscape framework in an area that currently has no discernible or desirable landscape quality.

Landscape proposals include the taking of additional land in the north-west and south-east sectors of the new bridge and approach roads. Side slopes would be relaxed in these sectors to improve integration of the substantial earthworks in the context of the generally open landscape of the area. Planting associated with the new structure and embankments would comprise a combination of woodland and woodland edge planting to soften the impact of the structure and screen views of traffic using the local road.

Scrub planting would be introduced at the northern end of the enclosed balancing ponds, the remainder of the area being sown with a wildflower mix. The landscape proposals for the two ponds at the eastern end of the bypass allow for enclosure to the northern and western margins of the ponds with scrub planting. The margins adjacent to the newly aligned A421 would be modelled to establish a formal landform of berms and banks in a sculpted form to contrast with the informality of the other margins and establish a distinctive local feature on this approach to Bedford. The open margins of the ponds would be sown with a wildflower mix other than for the sculpted banks which would be sown with a maintained road verge mix.

Planting associated with the new roundabout would comprise specimen tree planting set within a central area of wildflower and an outer maintained margin of road verge grass. The specimen trees would be complemented by woodland planting to the outer north-west and north east sectors of the roundabout.

The whole of the proposed landscape structure east of the bridge would be linked by a number of hedges and hedgerows with trees to complete the sense of formality which underscores the approach. A hedge would be introduced along the northern and southern boundaries of the bypass to link the areas of planting associated with the bridge approaches, the balancing ponds and new planting adjacent to the hotel. The southern hedge would be returned east of the balancing ponds.

6.6.6 Off-Site Planting

A partnership of four local authorities in the area is currently promoting an initiative to increase the extent of existing woodland, hedges and hedgerows within the open agricultural landscape that typifies the eastern section of the proposed bypass corridor. Discussions would be held with landowners to identify the potential for introducing hedges and hedgerows adjacent to highway land in the form of off-site planting in support of this initiative.

6.7 Traffic Noise and Vibration

6.7.1 Properties Eligible for Noise Insulation

A preliminary assessment has been carried out of the properties eligible for noise insulation along the Great Barford Bypass route, as specified by the Noise Insulation Regulations.

The assessment has indicated that no properties would be eligible for noise insulation from traffic noise

6.7.2 Construction Noise Mitigation

During construction activities, noise insulation is usually provided to properties assessed to experience noise levels of 75dB(A) or more, for a substantial period of time, providing that this level is 3dB(A) higher than the prevailing level before construction is started. Two months is normally considered a substantial period of time.

No property is currently predicted to experience noise levels which justify the provision of noise insulation against construction noise.

In order to minimise disruption to local residents from construction noise, discussions would be held with the Local Authority to agree acceptable noise control limits. The noise control limits would be included in the Contract Documents for the construction of the scheme. Monitoring of noise would take place to ensure compliance with the limits imposed.

6.8 Pedestrians, Cyclists and Community Effects

Mitigation to minimise route severance effects would take the form of the following:

- At the western end of the scheme, Water End Lane would be linked to existing routes and the new Bypass by a grade separated “dumb-bell” junction.
- Overbridges at the respective crossing points would carry Barford Road, Birchfield Road, the access track to High Barns Farm and Roxton Road over the Bypass, maintaining access and removing severance. There would be no nett loss of Rights of Way as a result of the proposed scheme.
- During the construction period, footpath and bridleway diversions would be provided throughout the full length of the scheme. Generally diverted routes would be carried over the Bypass by the proposed overbridges. Two routes would be diverted through proposed underpass/drainage culverts. The only at grade footpath crossing would be at Black Cat Roundabout and would be similar to the current provision across the existing A421.

6.9 Vehicle travellers

The principal mitigation for vehicle travellers would be provided by operation of the proposed Bypass, as it would alleviate driver stress and shorten journey times.

6.10 Water Quality and Drainage

6.10.1 Construction Phase

Control of spillages during the construction phase would include the management of materials on site and methods of construction in accordance with the highway specification.

6.10.2 Mitigation Measures at Junctions

From discussions with the Environment Agency petrol interceptors would be used at the Water End and Black Cat Junctions. The oil interceptors would collect all the surface water within 100m of the junction before discharging into the balancing ponds. The balancing ponds would offer additional secondary protection by containing any spillages via a dip plate control outlet structure, prior to discharging to the existing watercourse regime.

6.10.3 Linear Drainage

Runoff from the highway would eventually enter a number of balancing ponds, which would be situated throughout the route of the Bypass.

6.10.4 Balancing Ponds

There would be nine balancing ponds situated throughout the Bypass. These primarily contain surface water runoff from the new Bypass. The ponds have been designed to store the surface water runoff equivalent to a 1 in 100 year return period.

Water from the balancing ponds would discharge into the existing watercourses. The flow of water would be controlled by a dip plate structure and orifice.

6.10.5 Groundwater

Aquifers of limited yield such as the Cornbrash Limestone and the Kellaways Sand occur beneath the Oxford Clay at depths of at least 20m and are not expected to be affected by the proposed scheme, and so no mitigation has been identified.

6.11 Geology and Soils

No mitigation has been identified for the loss of 44ha of MAFF Grades 2 – 3a arable land. Landowners would be compensated accordingly.

6.12 Policies and Plans

No mitigation measures have been identified as the assessment has indicated that the improvement proposals would generally accord with the key objectives that underpin relevant national, regional and local policies and plans.

7.1 Traffic Flow and Accident Frequency

The traffic assessment has showed that construction of the bypass would result in a permanent decrease of through traffic flow in the village of Great Barford resulting in an associated decrease in predicted accident rates.

7.2 Air Quality

The localised air quality assessment has demonstrated that residential properties in Great Barford, on the fringe of Roxton and along the route of the A421 would benefit from a significant reduction in pollutant concentrations with the proposed Bypass in place. A total of 504 properties would experience improved air quality as a result of the proposed Bypass. Just 2 properties, situated to the north of the Bypass on Water End, would experience a slight increase in pollutant concentrations as a result of the Bypass.

7.3 Cultural Heritage

A total of nine areas of archaeological significance would potentially be affected by construction of the proposed A421 Great Barford Bypass. Appropriate mitigation measures – involving further detailed trial excavations during Spring 2002, recording and photographing during construction – would be agreed with the County Archaeologist at Bedfordshire County Council.

Four Grade II listed buildings, and two Scheduled Ancient Monuments (SAMs) located within 500m of the route could experience some minor effects during construction works, resulting from dust nuisance, but no significant effects are expected. The implications for the remainder of the listed buildings and scheduled monuments in the study area are expected to be negligible. Designed landscaping around the Bypass junctions would limit the extent of any effects on the setting of the listed buildings.

The effects of the proposed Bypass upon the Cultural Heritage of the study area are likely to be adverse and minor in importance. Should trial pitting during 2002 and watching briefs during construction yield any significant findings, this assessment grading could change.

7.4 Disruption Due to Construction

The principal construction effects of the proposed Great Barford Bypass would be at the junctions at each end of the proposed scheme, where the most disruption to pedestrians, cyclists, equestrians and travelling times would be caused. To a lesser extent, there would also be disruption to vehicle travellers, pedestrians and equestrians in the vicinity of the overbridges to be built on Barford Road, Birchfield Road, High Barns access track and Roxton Road respectively.

The primary conclusion is that for the majority of the route, disruption caused by the construction of the Bypass scheme would be minimal, as it is to take place on mostly agricultural land. The exception to this would be at the junction areas at either end of the route, where existing roads are located. Mitigation, in the form of temporary re-routing of rights of way and traffic management measures, would be provided.

7.5 Ecology and Nature Conservation

The main area having residual effects would be the eastern parkland at Howbury Hall, where approximately 3ha would be lost and a planted landscaped bund would be provided to mitigate for noise and visual impacts on the eastern parkland.

Following establishment of landscaped areas and balancing ponds, there would be no significant residual impacts on ecology and nature conservation.

7.6 Landscape Effects

The assessment has identified nine key character zones. Impacts and residual effects are summarised in the table below.

Character Zone	Impact Ratings	
	Winter Year of Scheme Opening	15 Years After Scheme Opening
A	Substantial Adverse	Substantial Adverse
B	Slight Adverse	Neutral
C	Moderate Adverse	Slight Adverse
D	Neutral	Neutral
E	Slight Beneficial	Slight Beneficial
F	Slight Beneficial	Slight Beneficial
G	Slight Adverse	Slight Adverse
H	Neutral	Neutral
I	Neutral	Neutral

Table 7-A *Summary of Landscape Effects*

7.6.1 Overall Landscape Impact Rating

Taking into account the predominance of neutral to slight and adverse impacts, the localised nature of substantial adverse impact and benefits for Great Barford and Great Barford House, the overall impact related to landscape character has been assessed as being slight and adverse.

7.7 Visual Impacts

With mitigation measures in place and established there would be no visual impacts for properties within the road corridor.

Similarly, with mitigation measures in place and established there would be no substantial visual impacts for users of local rights of way.

7.8 Traffic Noise and Vibration

- Modelling results of the “Do Something” scenario suggest that the bypass scheme would provide noise relief to 144 properties, which would experience a decrease in noise of 3dB(A) or more, this decrease is equivalent to at least halving of traffic.
- With the scheme in place, 8 residential properties would experience an increase in noise level of 3dB(A) or more. These properties are Mill House, 2 and 4 Water End, Birchfield Farm, Little Birchfield Farm, Brewers Hall Farm, High Barns Farm and High Barns Bungalow.
- Without the Great Barford Bypass, the noise impacts would worsen for 116 properties. No one would be better off and experience a decrease in noise levels. With the Great Barford Bypass, a noticeable noise reduction would be experienced at 145 properties, however 8 properties would suffer increased road noise traffic.
- Comparing the do minimum option with the proposal option and the do minimum option for the assessment year, 6 properties are higher with proposal and 144 higher with the do minimum situation. Only 3dB changes considered. A net benefit of 138 properties
- No properties are likely to be eligible for noise insulation due to increased traffic noise. In addition no properties are likely to require insulation against construction noise.

7.9 Pedestrians, Cyclists and Community Effects

The proposed Bypass would benefit pedestrians, cyclists and equestrians by improving road safety, reducing uncertainty and improving quality of the environment along the existing road.

The only area of concern that has arisen from the assessment, is that of the severance of the footpaths and bridleways. This issue would be mitigated by the installation of overbridges and underpasses. No net loss of Rights of Way would take place as a result of constructing the Great Barford Bypass.

7.10 Vehicle Travellers

The proposed Bypass would offer a sequence of open and closed views dominated by arable and agricultural land broken by a combination of existing scattered woodland, fragmented hedgerows and proposed roadside planting. There would be a strong sense of enclosure throughout the western section of the road whilst the eastern section would remain open in character although this length of Bypass would be in shallow cutting. The quality of view would be good to ordinary to the west and ordinary to the east in keeping with the landscape character analysis for the corridor.

Driver stress would be reduced by the provision of the new road.

7.11 Water Quality and Drainage

Whilst the scheme could have some minor effects on the water environment during construction, once it is in operation, the flow of water in watercourses would be controlled by the introduction of balancing ponds.

7.12 Geology and Soils

The assessment of the available information indicates that the proposed scheme would not have significant effects on the underlying geology and soils.

The principal impacts of the proposed route on topography would be related to the proposed earthworks along the route and especially at the junctions and locations of the structures where some deeper cuttings and new approach embankments are required. Mitigation measures for these areas would be provided.

There is no indication of widespread land filling or any ground and groundwater contamination in the areas under consideration. Relatively large volumes of the surplus material that would be disposed off-site during construction would have effects on the construction time scale, traffic, noise and dust.

7.13 Policies and Plans

The assessment has indicated that the improvement proposals would generally accord with the key objectives that underpin relevant national, regional and local policies and plans.

In some cases they would demonstrably aid realisation of policy objectives, as the Great Barford Bypass is specifically mentioned in keynote Government White Papers and Transport Plans.

In terms of local planning policies, the principal conflict would be with regard to the loss of MAFF Grade 2-3a agricultural land. However, this would be balanced by the transport policies that accord with the Government legislation and which support improvements to strategic routes. In addition, the Great Barford Bypass would be in accordance with other policy areas, such reducing air and noise related pollution, providing safer routes to school and ensuring adequate landscape design.

The proposals would not prejudice any current planning applications.

GLOSSARY OF TERMS USED IN THIS DOCUMENT

Term	Meaning
Alluvium	Geological term for fine, sandy river deposits.
AQS	Air Quality Standard
Balancing Ponds	Ponds that store volumes of water at levels greater than natural levels of run-off.
Baseline	Existing situation.
Built Form	The shape and size of a building.
Cropmarks	Marks in fields indicative of archaeological sites.
Designations	Notable sites, areas or buildings protected by planning or other laws e.g. Scheduled Ancient Monuments (SAMs), Sites of Special Scientific Interest (SSSIs).
Design Year	The design year of a road scheme is defined as 15 years after scheme opening. For the Great Barford Bypass, scheme opening is expected to be 2005 and so 2020 is considered to be the design year.
Dip-plate Structure and Orifice	Engineered structure controlling water flow to enable retention of contaminants.
Draft Orders	Explained in Section 1.3.3
Dumb-bell	The shape of the Water End junction when viewed in plan, consisting of two roundabouts joined by an overbridge.

Term	Meaning
Enclosure Systems	Historical pattern of fields.
Findspot	Location of archaeological discovery.
Flyway	Flight corridor used by bats.
Fugitive Dust	Dust which is generated due to a particular activity or process that is carried by the wind and deposited away from the source.
Glacial Till	Geological term – a mixture of rough gravels suspended in soil deposited at the base of a retreating glacier during the last Ice Age.
Greenfield Run-off Rates	The standard rates of run-off from fields.
HGV	Abbreviation for Heavy Goods Vehicle.
L _{Aeq}	Noise measurement term where varying levels are averaged to give an equivalent level of noise audible to the human ear over a period of time.
Land take	Land required for the scheme.
MAFF	Abbreviation for the former Ministry of Agriculture, Fisheries and Food, now part of the Department of Environment, Food and Rural Affairs (DEFRA).
NETCEN	UK Air Monitoring Networks.
NO ₂	Abbreviation for nitrogen dioxide.
Notifiable	Worthy of note.
Perched Water Table	A layer of suspended water above the main prevailing water table.

Term	Meaning
Permeability	Ability of medium to allow water to drain through e.g. clay would be fairly impermeable whereas sand would be permeable.
Pit alignment	Archaeological term.
Receptors	Humans, Wildlife
Significance Criteria	Defined levels at which measurements become significant.
Signposting	Method of conveying directional information to road and rights of way users.
Solid Loading	Release of solid materials into water resulting in suspension of solids and particles.
Terrace Gravels	Geological term – Eroded materials carried in rivers becoming deposited following a change to the river profile during inter-glacial periods.
Tidal flow (of traffic)	Describing the variation in traffic flow due to am and pm peaks of movements.
Watching Brief	Relating to the potential for archaeological finds where a qualified archaeologist is present on site during excavation works to examine the earth moved for the presence of archaeological objects or sites.
Year 2005	Proposed Great Barford Bypass scheme opening date.

Term	Meaning
Year 2020	15 years after scheme opening – the “Design Year” (see definition above).

FIGURES

These are included as a separately bound document – Part 2 of this report.

Appendix A - List of Organisations Consulted and Summary of Responses Received

Name of Organisation	Summary of Response
Bedford Borough Council	Letter received 1.3.01 detailing details of current planning applications in vicinity of route.
Bedfordshire Wildlife Trust	Response received 18.1.01 with site details of some of the County Wildlife Sites within 1km of the scheme (see response from Bedfordshire County Ecologist below). Recommended badger surveys should be carried out as there were records in the area. These have been completed.
Bedfordshire County Council	Telephone response received 8.12.00. Unlikely that any non-statutory sites present, but would check on scheme map in due course. Formal response received 20.12.00 containing maps showing locations of 6 No. non-statutorily designated County Wildlife Sites in the vicinity of Great Barford, none of which area affected by the scheme.
Bedfordshire County Council	Various searches requested. Response received 8.9.00 detailing areas of archaeological interest. Telephone response received 11.12.00. Hedgerows present may be historically important, even if not ecologically valuable, and so would be notifiable under Hedgerows Regulations, 1997. Would carry out a search for historical hedgerows along route corridor following receipt of current route map. Results of search received 5.1.01. 24 no boundaries traversed by the scheme are affected by the Hedgerow Regulations, 1997 as they are "recorded in a document held at the relevant date at a Record Office as an integral part of a field system pre-dating the Inclosure Acts [1845 to 1882]" and are thus "important" according to the Regulations.
Bedfordshire County Council	See response from S Coleman above.
Bedfordshire RIGS Group	Letter sent 6.9.00. No record of a response in the JacobsGIBB files.
Countryside Agency	Response receive 23.10.00. Line of the Bypass runs through the Bedfordshire and Cambridgeshire Claylands Character Area No 88, as defined in the Agency's Countryside Character Assessment.
Countryside Agency	Response received 18.9.00. As the route does not fall within a National Park, AONB or Heritage Coast, the Countryside Agency did not wish to comment.
DETR (now DTLR)	Response received 11.9.00 from Michael Evans. No archaeological sites present along the proposed scheme line. States that the London to South Midlands Multi-Modal Study being commenced.
English Heritage	Letters sent 21.8.00 and 6.7.01. No record of a response in JacobsGIBB files.
English Nature, Peterborough Office	Telephone response received 8.12.00. No SSSI's present in area east of Bedford as far as the Sandy area. Would expect surveys for badgers and newts to be carried out, as are recorded in area. Results of records search received 15.1.01. Bats recorded in buildings in Great Barford village (south of scheme), Renhold village (north of scheme) and Roxton village (south of scheme). One record for great crested newt and one record for water vole in the Renhold area.
Environment Agency	Details of discharges, abstractions and water quality in the area.
The National Trust	Response received 4.9.00. One Grade 1 Listed property owned in Great Barford – Willington Dovecote and Stables.

Table 7-B Summary of Consultations carried out