

A47 North Tuddenham to Easton Dualling

Scheme Number: TR010038

Volume 6

6.1 Environmental Statement **Chapter 3 – Assessment of alternatives**

APFP Regulation 5(2)(a)

Planning Act 2008

Infrastructure Planning (Applications: Prescribed
Forms and Procedure) Regulations 2009

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Infrastructure Planning

Planning Act 2008

**The Infrastructure Planning
(Applications: Prescribed Forms and
Procedure) Regulations 2009**

The A47 North Tuddenham to Easton
Development Consent Order 202[x]

**ENVIRONMENTAL STATEMENT CHAPTER 3
ASSESSMENT OF ALTERNATIVES**

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3. Assessment of alternatives

3.1. Assessment methodology

3.1.1. The Proposed Scheme has been subject to a process of staged development and evolution. The main development stages were:

- identification of the need for the project
- options identification
- options selection
- preferred route announcement (PRA)
- post PRA design development for statutory consultation
- continued design development post statutory consultation

3.1.2. In seeking to resolve the transport problem between North Tuddenham and Easton (further detail on issues provided in Chapter 2 (The Proposed Scheme) (**TR010038/APP/6.1**)), 14 potential options were developed. These were assessed to identify their performance against environmental, engineering, transportation and economic criteria so that they could be compared and contrasted.

3.1.3. Four of the 14 options were taken forward for more detailed assessment and non-statutory public consultation due to performance on environment, engineering, traffic and economics. The four options, as identified in the Scheme Assessment Report, were option 1, option 3, option 4 and option 6. For the purposes of this summary, the options have been renumbered 1 to 4 (as shown in Figure 3.1, 3.2, 3.3 and 3.4):

- Option 1: offline dualling to the north of the existing A47.
- Option 2: online dualling of the existing A97.
- Option 3: offline dualling to the south of the existing A47 for the western part of the route and to the north for the eastern path of the route.
- Option 4: offline dualling to the south of the existing A47.

3.1.4. These options can be reviewed in the Scheme Assessment Report (2017) at the following link:

https://highwaysengland.citizenspace.com/he/a47-north-tuddenham-to-easton-february/supporting_documents/A47%20North%20Tuddenham%20to%20Easton%20Scheme%20Assessment%20Report%20SAR.pdf

3.2. Reasonable alternatives studied

- 3.2.1. All four options that were selected were able to resolve the transport problem and allow a safer, swifter movement of traffic along the route corridor.
- 3.2.2. All options had two main junctions situated on the A47. The junction strategy for all four options was similar with the existing grade separated junction at Fox Lane to be retained. The proposed second junction would be provided to the eastern end of the Proposed Scheme between Easton and Honingham. No other junctions or accesses were included in the options.
- 3.2.3. No walking, cycling and horse-riding facilities were proposed or any crossings proposed in any of the options.

Option 1

- 3.2.4. Option 1 proposed building a new dual carriageway to the north of the existing A47. The single carriageway section of the A47 between North Tuddenham and Easton would be improved to dual carriageway standard by the construction of a new section of offline dual carriageway with appropriate junction improvements. The proposed new dual carriageway for this option follows an alignment running parallel and approximately 500m to the north of the existing A47 highway corridor. See Figure 3.1 overleaf.
- 3.2.5. Option 1 would pass to the south of Hockering Wood SSSI and to the north of Hockering with the remainder of the route passing predominantly through open farm land and some woodland habitat before crossing the River Tud close to Easton.
- 3.2.6. This option was identified as having a larger environmental impact than online options due to the proposed increased land take and disturbance. The Scheme Assessment Report identified that the impacts on landscape, biodiversity and water environment were assessed as adverse impacts and the noise impact was assessed as slight adverse due to proximity of route to Hockering. The Scheme Assessment Report identified this option as the third preferred option for the environment.
- 3.2.7. The initial transportation assessment identified this option as being the shortest route and therefore was the best ranked option in the Scheme Assessment Report. The engineering assessment stated that this option was the best ranking due to the fact it is offline which is considered easier to construct than online solutions. In the economics assessment, this option was the best ranking due to the costs for construction was considered to be cheaper due to decreased traffic management costs as it is an offline option and the fact it is the shortest route.



Figure 3.1: Option 1

Option 2

- 3.2.8. The single carriageway section of the A47 between North Tuddenham and Easton would be improved to dual carriageway standard by the construction of a new section of online dual carriageway with appropriate junction improvements.
- 3.2.9. The new dual carriageway follows an alignment running as close as possible to the existing A47. Improvements to the existing alignment would be required to bring the route up to dual carriageway standards. See Figure 3.2 overleaf.
- 3.2.10. This option was identified as having less of an environmental impact than the other offline solutions due to less disturbance and impact on soil, particularly with regard to impact on landscape, biodiversity and water environment. This option was identified as being the environmentally preferred option.
- 3.2.11. The transportation assessment in the Scheme Assessment Report identified this option as being the fourth best performing option due to the shorter route which would offer quicker journey times. The engineering assessment concluded as this option was online it is considered to be more difficult to construct due to increased phasing and traffic management. This option would also present an increased effect on statutory undertakers. In the economic assessment, this option was ranked 12th due to the fact it is online and offline as the cost of construction and traffic management delays caused by online construction. Consultation feedback identified this option as being the preferred option.



Figure 3.2: Option 2

Option 3

- 3.2.12. Option 3 proposed building a new dual carriageway to the south and to the north of the existing A47. The new dual carriageway follows an alignment running to the south of the A47 but to the north of the River Tud as the route passes the village of Hockering. The carriageway then switches to the north of the existing A47 as the route passes the village of Honingham. The route passes predominantly through open farm land and some woodland habitat and crosses the River Tud. See Figure 3.3 overleaf.
- 3.2.13. The offline option was likely to have larger environmental impact than the online options. In the Scheme Assessment Report the impacts on landscape, biodiversity and water environment were assessed as adverse impacts. Noise and air quality impacts were assessed as being neutral due to the route moving traffic further from Hockering and Honingham. The Scheme Assessment Report concluded that this option would be the second preferred option for the environment.
- 3.2.14. The transportation assessment in the Scheme Assessment Report identified this option as being the third best performing option due to the shorter route which would offer quicker journey times. The engineering assessment concluded that this option would be the third best performing as it is offline and therefore considered easier to construct. The economics assessment ranked this option as the second best performing due to the costs for construction are considered to be cheaper due to decreased traffic management costs as it was an offline option.



Figure 3.3: Option 3

Option 4

- 3.2.15. Option 4 considered a new dual carriageway to the south of the existing A47. The new dual carriageway follows an alignment running to the south of the existing A47 and to the south of the River Tud. At the western end of the Proposed Scheme, it crosses the River Tud before passing to the south of the village of Honingham and returning to the A47. The route runs predominantly through arable farmland and semi-improved grassland. See Figure 3.4 overleaf.
- 3.2.16. This option was likely to have a larger environmental impact than the online options. The Scheme Assessment Report assessed the impacts on landscape, biodiversity and water environment as adverse impacts. Any noise impacts were assessed as slight adverse due to proximity of route to Honingham. This option was identified as being the least preferred option for the environment.
- 3.2.17. The transportation assessment in the Scheme Assessment Report identified this option as being the eighth best performing option due to the shorter route which would offer quicker journey times. The engineering assessment concluded that this would be the second best performing option as it is an offline solution which is considered easier to construct than online options. In terms of economics, this option was the third best performing option as the costs for construction are considered to be cheaper due to decreased traffic management costs as it was an offline option. Consultation feedback identified this option as being least favourable.



Figure 3.4: Option 4

3.3. Justification for the chosen option

- 3.3.1. From the options assessed and consulted upon, as described in the Case for the Scheme (TR010038/APP/7.1), a preferred route was selected. It is considered that the preferred option has the least impact on the environment and can be built with the least disruption to drivers during construction as the existing road can remain for local traffic.
- 3.3.2. Upon review of the non-statutory consultation feedback and route option assessments, a variation on Option 2 was taken forward. This option was identified as solving the existing traffic and safety problems as well as having the least impact on the environment, compared to the other options.
- 3.3.3. Following non-statutory consultation feedback, the alignment of Option 2 was moved to ensure the preferred route could be built with the least disruption to drivers during construction as the existing road could remain open for local traffic movements, pedestrians, cyclists and equestrians. The chosen option deviates locally from the existing A47 which would provide the following benefits:
- Reduce the impact at the western end on Oak Farm, minimising the impact on the existing properties on Mattishall Lane.
 - Minimise, where possible, the impact on properties close to the existing A47 at Hockering.
 - Reduce the impact of the road on the River Tud.

- Keep the road widening to the north side of the corridor as it passes Honingham.
- Keep the route to the north at the existing junction at Easton to maximise the chance of the local road reconnection being alongside and to the north of the church at Easton.

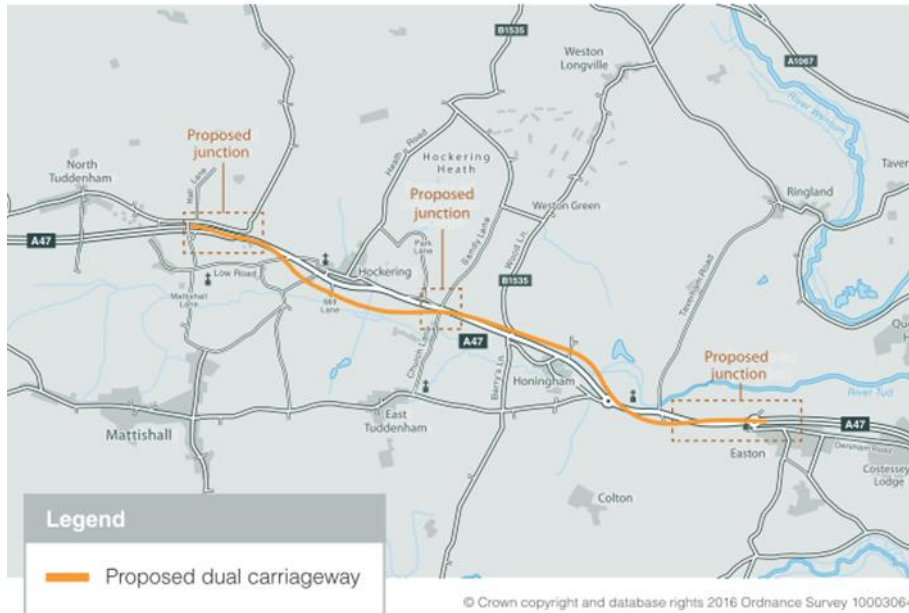


Figure 3.5: The chosen option

3.3.4. Further information on the process is reported here:

Preferred Route Announcement (2017)

<https://highwaysengland.citizenspace.com/he/a47-north-tuddenham-to-easton-dualling/results/s170173-a47-preferred-route-announcement-leaflet--tuddenham--b.pdf>

EIA Scoping Report (2019) (TR010038/APP/6.5)

<https://infrastructure.planninginspectorate.gov.uk/wp-content/ipc/uploads/projects/TR010038/TR010038-000028-TUDD%20-%20Scoping%20Report.pdf>

Preliminary Environmental Information Report (2020)

https://highwaysengland.citizenspace.com/he/a47-north-tuddenham-to-easton-february/supporting_documents/A47%20North%20Tuddenham%20to%20Easton%20%20Preliminary%20Environmental%20Information%20Report%20PEIR.pdf

3.4. Chosen option design development

- 3.4.1. The Proposed Scheme has been further developed since the preferred route announcement. Taking on board feedback received and from ongoing stakeholder engagement the design of the Proposed Scheme has been developed to that now set out within the DCO application.
- 3.4.2. The Proposed Scheme has been identified as the best option to meet the defined need and objectives, including the delivery of a comprehensive set of benefits as detailed in this document.
- 3.4.3. Transportation benefits include reduced journey times and improved safety, resilience and journey time reliability consistent with national and local planning objectives for transport, economy and the environment.
- 3.4.4. Through the increased capacity and improved journey time reliability, the Proposed Scheme would assist in making the region more attractive for businesses and provide the required infrastructure for development including housing and employment.
- 3.4.5. A number of sub-alternative considerations around the development of the chosen option design have been undertaken following feedback from the statutory consultation events (2020). These design developments are outlined in the Scheme Design Report (**TR010038/APP/7.3**), submitted as a part of this DCO application. The following key design changes have occurred following the alignment presented at statutory consultation:
- New vehicle underpass at Mattishall Lane, referred to as Mattishall Lane Link Road
 - Link to Church Lane, north of existing Easton roundabout, has been removed and replaced with a shared footway / cycleway
 - Removal of the WCH underpass at Church Lane
 - Removal of the sideroad between Church Lane, East Tuddenham, and the southern roundabout of Wood Lane junction
 - New access track from Church Lane, East Tuddenham, to Hillcrest Cottage
 - WCH link between roundabouts at Norwich Road junction, via the overbridge, has been removed
 - Footway/cycleway provision has been added to the north side of the carriageway on the existing A47 to be de-trunked between the Hall Farm underpass and the Honingham roundabout west of St Andrew's Church
 - Norwich Road junction moved 150m east, removing the requirement for a retaining wall at St Andrew's Church
 - Provision of Honingham church underpass for walkers and cyclists

- Removal of link road to Blind Lane
- Removal of vehicular link between the northern roundabout of Norwich Road junction and Church Lane at Easton
- Provision of Easton footbridge

Junction Design

- 3.4.6. The existing single carriageway along the A47 between North Tuddenham and Easton has numerous junctions with major and minor local roads, plus direct access from farms.
- 3.4.7. At the western end of the Proposed Scheme lies the existing A47 junction with Fox Lane; known as Fox Lane junction. Operational traffic modelling and safety assessments confirmed Fox Lane junction required no further improvements as part of the Proposed Scheme. Meanwhile, existing constraints beside the Easton roundabout, such as the Grade I listed St Peter's Church, influenced the decision to locate the Proposed Scheme's eastern junction with Taverham Road and Blind Lane.
- 3.4.8. Therefore, the Proposed Scheme contains two new junctions onto the proposed A47 from the local roads:
- Wood Lane junction, at the existing A47 junction with Wood Lane and Blind Lane (and including a future connection to the proposed Norwich Western Link)
 - Norwich Road junction, at the existing A47 junction with Taverham Road and Blind Lane

Wood Lane junction

- 3.4.9. The junction serves as an important link for people and communities using community facilities in Hockering and Honingham.
- 3.4.10. The original preferred junction design proposed a new at grade roundabout located north-west of Honingham with connections to Wood Lane to the north and Berrys Lane to the south. This roundabout includes a future connection for the proposed Norwich Western Link road.
- 3.4.11. Traffic analysis of the at grade roundabout indicated that during afternoon (PM) peak hours several arms of the roundabout would be operating over the target capacity (85%) leading to unacceptable delays.
- 3.4.12. The results of the traffic modelling, reported in the Case for the Scheme (**TR010038/APP/7.1**), determined that an at grade roundabout was not suitable. Therefore, the design of the Wood Lane junction was amended to a full grade separation layout.

- 3.4.13. Statutory consultation responses highlighted concerns that a direct connection between Wood Lane and Berrys Lane may provide a north-south rat run. Subsequently the final Proposed Scheme has removed this connection and retained more of the existing A47 to provide a side road link, from the southern roundabout of Wood Land junction, that heads east towards the existing Honingham roundabout where users would then travel south via Mattishall Road.
- 3.4.14. The final junction design also took into consideration various constraints, such as: the landscape setting of the Grade II listed Berry's Hall to the south-west; presence of a high pressure gas pipeline; need to retain access to Honingham via Dereham Road; and need to maintain walker and cyclist connection between Berrys Lane and Honingham.

Norwich Road junction

- 3.4.15. With the removal of the Easton roundabout, there is a need for an A47 junction between Hockering and Easton.
- 3.4.16. The original preferred design for the Norwich Road junction was a new at grade roundabout located adjacent to the existing A47 roundabout at the junction with Norwich Road. There would be connections to Norwich Road to Honingham and Mattishall in the west and to a new diversion route leading to Church Lane (Easton) to the east.
- 3.4.17. Traffic analysis of the at grade roundabout indicated that at morning (AM) peak hours several arms of the roundabout would be operating over the target capacity (85%), leading to unacceptable delays. The results of the traffic modelling determined that an at grade roundabout was not suitable; see the Case for the Scheme (**TR010038/APP/7.1**).
- 3.4.18. The design of the Norwich Road junction was amended to a full grade separation layout. The design also sought to minimise agricultural land take within the constraints of the River Tud to the north and Local Plan designated development land to the south.
- 3.4.19. In response to statutory consultation feedback, the junction design was amended to remove the northern side road connection between Taverham Road and Church Lane, in Easton, providing benefits of a reduced land take.

Side roads

- 3.4.20. The existing single carriageway A47 has numerous direct connections from existing side roads plus farm and field accesses.
- 3.4.21. In order to meet the objective of creating a more free-flowing and safe A47 there are to be no direct side road connections to the dualled A47 in the Proposed

Scheme, with access only via the two junctions (Wood Lane junction and Norwich Road junction).

- 3.4.22. Therefore, a sideroad network has been developed to create a parallel local link road network between North Tuddenham and Easton by utilising the existing A47 carriageway or constructing new single carriageway roads. Existing side roads severed by the proposed A47 dual carriageway would be connected to the new link roads and the existing local road network. A summary of how the side roads have been integrated into the Proposed Scheme is presented in Chapter 2 (The Proposed Scheme) of the ES (TR010038/APP/6.1).

Structures design

- 3.4.23. The Proposed Scheme has a number of existing and proposed structures:

- five unaffected existing structures
- modification of the existing A47 crossing of the River Tud (known as the Honingham Bypass)
- seven new bridge structures
- one new culvert structure¹

- 3.4.24. The structures are to be designed to comply with current good practice and the required standards, and would fulfil the following scheme-wide criteria:

- provide highway clearances, headrooms and loading requirements
- provide for walking, cycling and equestrian requirements where relevant
- comply with the requirements of third-party stakeholders where relevant

Mattishall Lane Link Road underbridge

- 3.4.25. Two options were considered for the Mattishall Lane Link Road underbridge, with the main variation in the options being the structural form:

- in-situ concrete box
- jointed portal frame units

- 3.4.26. The estimated capital cost and comparative life cost of option 2 is marginally greater than option 1. However, option 2 was selected for its substantial benefits in construction simplicity and significant health and safety benefits associated with using precast units.

¹ Newgate House culvert is a defined structure, whereby the new and extend West Culvert is just a pipe so not a engineering defined structure.

Wood Lane junction underbridge

- 3.4.27. Initially, four options were considered, but geotechnical investigations indicated that piles would be required at this location and as such an option to use a spread footing substructure design was discounted.
- 3.4.28. Two options were taken forward and developed further, with the main variation in the options being the substructure type:
- reinforced soil wall with reinforced concrete bankseat supported on reinforced concrete sleeved columns connected into a pile cap
 - in-situ concrete abutment wall supported on a pile cap
- 3.4.29. The estimated capital cost and comparative life cost of the in-situ concrete abutment wall is marginally greater than that of the reinforced soil wall. The anticipated construction programme is not likely to differ between the two options. However, in-situ concrete abutment option was selected for its substantial benefits in construction simplicity.

Hall Farm underbridge

- 3.4.30. Two options were considered for the Hall Farm underbridge, with the main variation in the options in the structural form:
- in-situ concrete box
 - precast concrete box made up of U-shaped units
- 3.4.31. The estimated capital cost and comparative life cost of precast units is marginally greater than the in-situ concrete box. However, the precast units were selected for substantial benefits in construction simplicity and significant health and safety benefits.

River Tud Crossing

- 3.4.32. Two options were considered for the River Tud Crossing, with the main variation in the options being the structural form:
- pre-stressed beam bridge
 - weathering steel beam bridge
- 3.4.33. The estimated capital cost and comparative life cost of the weathering steel beam bridge is lower than the prestressed beam option. The weathering steel beam bridge also has additional benefits in that it would reduce the weight and number of crane lifts.
- 3.4.34. Therefore, the preferred option for River Tud Crossing is a one span weathering steel plate girder structure.
- 3.4.35. The preferred design of the River Tud Crossing was developed through iterative review of options between the design team, environmental specialist, the principal contractor and the Environment Agency. This achieved a design that best balanced consent requirements, technical design challenges, buildability, cost, landscape integration, flood management and ecological considerations. For example, the presence of water voles (a protected species) and need to retain

natural river banks, the design worked around a principle of no works within 5m of the top of the river bank.

Norwich Road junction underbridge

- 3.4.36. Initially, five options were considered, but geotechnical investigations indicated that piles would be required at this location and as such an option to use a spread footing substructure design was discounted.
- 3.4.37. Two options were taken forward and developed further, with the main variation in the options being the structural form of the substructure:
- full height in-situ reinforced concrete abutments supported on bored piles
 - reinforced concrete contiguous bored piles with a top in-situ diaphragm
- 3.4.38. The estimated capital cost and comparative life cost of the in-situ reinforced concrete substructure is greater than the reinforced concrete contiguous bored pile substructure. The reinforced concrete contiguous bored pile substructure also has further benefits with regard to health and safety risks as it eliminates the need to work at height. However, the in-situ reinforced concrete substructure was selected as the preferred option for its substantial benefits in construction simplicity.

Easton footbridge

- 3.4.39. Initially two underpass structures and two overbridge options were considered, but the underpass options were discounted due to site constraints.
- 3.4.40. The three footbridge options were developed as follows:
- steel warren truss over the A47 supported on reinforced concrete bankseats situated on reinforced earth approach embankments
 - steel warren truss over the A47 supported on steel piers with steel deck approach ramps; the ramps would be supported by steel columns and the foundation would consist of concrete pile caps with bored piles
 - steel concrete composite footbridge supported on reinforced concrete bankseats situated on reinforced earth approach embankments
- 3.4.41. The steel concrete composite footbridge would be marginally more expensive than the warren truss with reinforced embankments. However, the composite footbridge would be made integral with the substructure which eliminates the need for mechanical bearings. This improves the durability of the structure and will reduce maintenance works throughout the service life. This results in reduced disruption to the users of the A47 and the surrounding walking and cycling routes.