



Norfolk County Council

Norwich Western Link
Environmental Statement Chapter 4:
Reasonable Alternatives Considered
Appendix 4.4: Ancient and Veteran Trees
Avoidance Alignment Optioneering Report
Document Reference: 3.04.04

Norwich Western Link

Environmental Statement

Chapter 4: Reasonable Alternatives Considered

Appendix 4.4: Ancient and Veteran Trees Avoidance Alignment Optioneering Report

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Document Reference: 3.04.04

Version Number: 00

Date: March 2024



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Glossary of Abbreviations and Defined Terms

Abbreviations

CDE	Common Data Environment
FER	Ferrovial Construction (<i>The Contractor</i>)
DC	Document Control
DCM	Document Control Manager
EDMS	Electronic Data Management System
QA	Quality Assurance
QM	Quality Manager
NCC	Norfolk County Council (<i>Client</i>)
NWL	Norwich Western Link
NH	National Highways
NB	Northbound
SB	Southbound
CR	Central Reserve
T	Tree (Singular)
LG	Tree (Linear Group)
RPA	Root Protection Area



1 Introduction

1.1 Purpose and content

1.1.1 This report outlines the review, on a case-by-case, basis of the seven ancient and veteran arboricultural features that would be lost due to construction of the Proposed Scheme.

1.1.2 The review assesses the possible realignment of elements of the Proposed Scheme that would be required to retain the impacted ancient and veteran trees, what further impact these changes have on surrounding arboricultural features and the viability of implementing these changes into the design.

1.1.3 The image below shows the seven ancient and veteran trees that are to be removed by the Proposed Scheme.

Figure 1.1: Locality of scheme and the Veteran / Ancient Trees





1.2 Scheme Details

1.2.1 The Proposed Scheme is a new highway to link the A1270 Broadland Northway, from its junction with the A1067 Fakenham Road (to the north) to the A47 trunk road near Honingham (to the south). This is described further in Environmental Statement - Chapter 3: Description of the Scheme (Document Reference: 3.03.00).

1.2.2 The original alignment of the Proposed Scheme avoided ancient woodland. Revisions to alignment have been made to reduce ecological impacts including to veteran and other high quality trees. This is described further in Environmental Statement - Chapter 10: Biodiversity (Document Reference: 3.10.00).

1.3 Background to Ancient and Veteran Tree review

1.3.1 An Ancient Tree is defined as a tree that has passed beyond maturity and is old, or aged, in comparison with other trees of the same species. Characterised by biological, cultural or aesthetic features of interest.

1.3.2 A Veteran Tree is defined as a tree that has the biological or aesthetic characteristics of an ancient tree but is not ancient in years compared with others of the same species.

1.3.3 Ancient and Veteran Trees hold significance due to their unique size, age or condition. They are primarily sought to be retained as irreplaceable habitat with ecological value and also to enhance the value of an area or development through their character and permanence.

1.3.4 The National Planning Policy Framework (NPPF) paragraph 186. c) states:

'development resulting in the loss or deterioration of irreplaceable habitats (such as ancient woodland and ancient or veteran trees) should be refused, unless there are wholly exceptional reasons and a suitable compensation strategy exists;'



- 1.3.5 The Applicant was requested to review the design to ascertain whether the seven Ancient and Veteran trees that would be lost because of construction of the Proposed Scheme could be retained. The Ancient and Veteran trees to be removed by the scheme are: T20, T49, T77, T82, LG138, LG141 and T220. A plan of these Ancient and Veteran trees and the Proposed Scheme can be seen in Appendix A.
- 1.3.6 This report reviews, on a case-by-case basis the potential design options that would enable the retention of the seven Ancient and Veteran trees, what further impact these changes have on surrounding arboricultural features and the viability of implementing these changes into the design.
- 1.3.7 Overall, this review finds that there is little opportunity for any of the seven Ancient and Veteran trees be retained. In each option, the remedial action to save any one tree requires the removal of at least one of a similar quality, providing no overall net gain. Furthermore, all bar one option require significant clearance of additional woodland. Due to the negative impact on the local biodiversity that the alternative options would have none of the Ancient and Veteran trees considered have been deemed feasible to save.
- 1.3.8 Each Ancient / Veteran tree to be felled will still provide essential habitats for the local flora and fauna. After being felled, each tree will be laid as close to their original location as possible or near existing woodland to provide a deadwood habitat area. The Woodland Trust describe deadwood habitats as, *“[They] may not look like much, but fallen branches, rotting stumps and dead trees are the lifeblood of any woodland. Decaying wood recycles nutrients back into the soil, provides food and nurseries for rare animals, and hosts spectacular collections of fungi.”*
- 1.3.9 The Trees and Woodlands referred to in this report are shown in full within Appendix C which is an extract of the Arboricultural Survey Report commissioned by the Applicant.



1.4 Assumptions

1.4.1 The following assumptions are made to undertake this review;

- Alternative options are assessed against the current design as of January 2024.
- 2D assessments only are made to understand the impact to horizontal mainline alignments, bunds, access tracks, boundary, drainage & structures. Approximations on impacts are made outside areas of topo/tree survey.
- 3D cut/fill assessments are not undertaken for the alternative solutions
- No additional survey undertaken for assessment of the alternative options
- No detailed structural/Geotech/drainage assessment undertaken for the alternative options assessment
- No consideration given to further impacts such as noise, visual impacts etc, however it is noted alignment alterations will have wider reaching environmental impacts than just trees and woodland.

1.5 References to Chainage

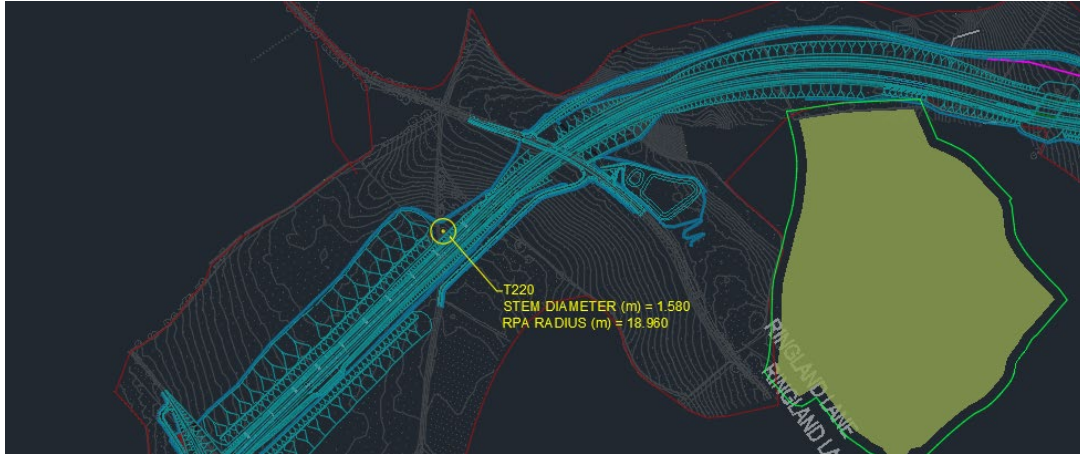
1.5.1 Throughout this document locations are identified through references to scheme chainage (e.g Ch. 2200). Drawings showing the scheme design and associated chainage can be found at 2.03.00 General Arrangement Plans drawings PK1002-RAM-HGN-MLE-DR-CH-0001 to 0008.

2 Ancient and veteran trees affected by the Scheme

2.1 Veteran Oak tree T220



Figure 2.1: Location of T220 relative to the carriageway



2.1.1 The Veteran Oak Tree T220 is situated at approximately Ch. 2000 adjacent to the proposed northbound carriageway. With a diameter of 1.580m and an RPA of 23.7m; the RPA encompasses most of the northbound lanes. To avoid T220, the Mainline Corridor can be moved either north or south of the tree as discussed below.

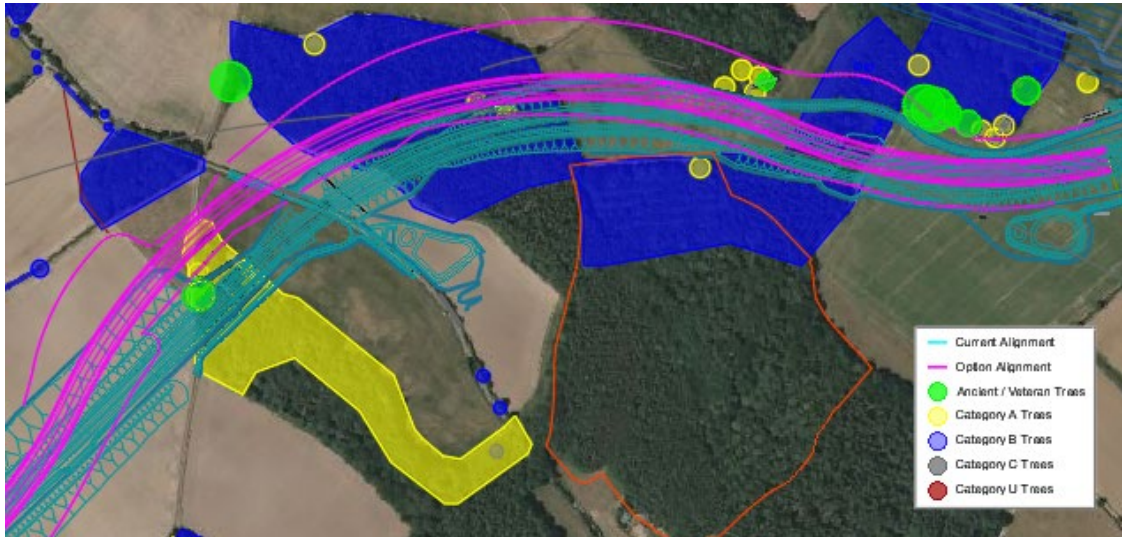
Option 1: Moving the Mainline Corridor to the north of T220

Figure 2.2: Option 1 to retain T220





Figure 2.3: Tree impacts of Option 1 to retain T220



2.1.2 Moving the Proposed Scheme to the north of T220 by pushing the alignment approximately 20m north has the following impacts:

- Further cutting of high quality trees on the north side of the current alignment around W325 which falls under “Category A” i.e. high quality. This option allows the design to avoid the Ancient Woodland which is highlighted with the orange boundary in the above figure. Option 1 also presents a saving of 11,000m² of woodland W235 but at the additional cost of 17,000m² of W242 and 2000m² of W269.
- Furthermore, whilst requiring an additional Circa 19,000m² of Category B trees to be removed, the option also impacts T268, T277, T278, T279, T280, T281, T284, T286 and T288. These trees are primarily Ancient/Veteran Oak Trees with T286 and T288 Notable Oak Trees.
- It requires redesign of Ringland Lane Bridge, Nursery Woodland green bridge, Drainage Basin 3 and realignment of the Maintenance Access track and Environmental bunds, with associated costs and assessment work required.
- This option impacts the mainline from Ch. 1000 to Ch. 2250 and requires the horizontal alignment curve to be set at the desirable minimum of a 720m radii.



- Changes to land acquisition requirements.

Option 2: Moving the Mainline Corridor to the south of T220

Figure 2.4: Option 2 to retain T220

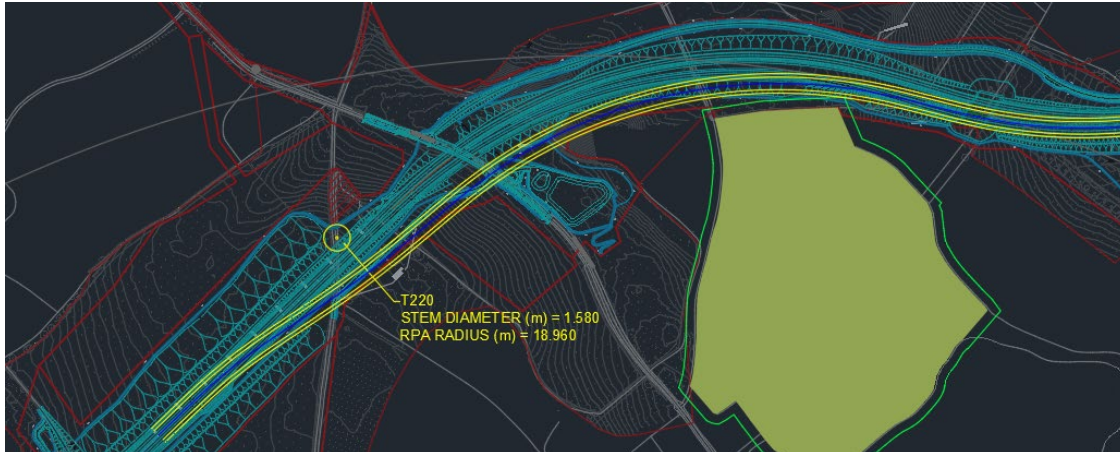
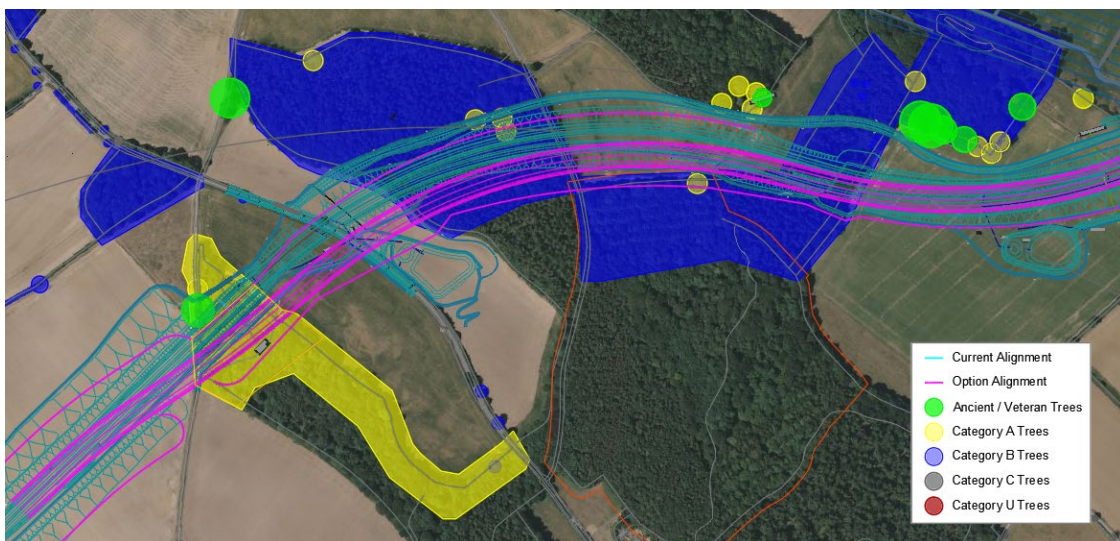


Figure 2.5: Tree impacts of Option 2 to retain T220



2.1.3 Moving the Proposed Scheme to the south of T220 by pushing the alignment approximately 50m to the south has the following impacts:

- Circa 13,000m² of additional removal of Moderate Quality woodland (Category B) W260, W269 is required. It should be noted that W260 is an ancient woodland and irreplaceable habitat – the impact of losing part of this would be greater than losing a single veteran tree.



- An additional 9000m² of Category A Woodland W235 is required to be removed.
- Impact on Ancient Woodland W260 requiring removal of trees and not maintaining the 15m buffer zone
- Felling of T233, a Notable Oak Tree within Category A as well as the felling of T261, a Category A Sycamore. Overall, to save T220 this would require the removal of two category A trees, one of which is notable.
- Impacts the mainline approximately from Ch. 1000 to Ch. 2300 resulting in realignment of environmental bunds, access tracks and redesign of Ringland Lane Bridge, Nursery Woodland green bridge and Drainage Basin 4.
- Changes to land acquisition requirements.
- This is not a geometrically feasible option because there are three reverse curves as seen above in Figure 2-4 and Figure 2-5. Whilst at desirable minimum radii, the reverse curves geometry could lead to large vehicles losing balance and overturning.

2.1.4 Options 1 and 2 are deemed not viable due to the consequential impact they have upon the surrounding woodlands, ancient woodlands, and other Veteran and Ancient Trees. Primarily, Option 1 impacts 8 further Veteran / Ancient or Category A trees to save just 1 Veteran Tree. In addition, there is significantly more woodland clearance required providing a net loss to the local ecology. Option 2 impacts the Ancient Woodland W260 and its 15m buffer zone adversely, along with impacts to two other Category A trees.

2.1.5 Furthermore, realigning the Green Bridges would deviate from good practice design principles for this feature and likely reduce the effectiveness of the structure as bat mitigation. A third option was considered to split the alignment either side of the T220 however, this has similar impacts to both options 1 and 2 resulting in an even more harmful option to the local environment and flora. Due to the requirement of having earthworks either side of the separate carriageways, the third option would have a similar footprint as options 1 and 2 for the respective lanes.



2.2 Linear group of Ancient and Veteran trees LG138 and LG141

Figure 2.6: Location of LG138 and LG141 relative to the carriageway



2.2.1 LG138 is a Veteran Hazel tree and LG141 is a pair of Ancient Field Maple trees. Both are situated within the proposed verge at Ch. 2970 on the Northbound carriageway of the Proposed Scheme. LG138 has a stem diameter of 1.500m and RPA radius of 22.5m, with LG141 having a stem diameter of 1.020m and RPA radius of 15.3m. Due to their close location, the two "Linear Group" trees RPA radius' covers the entirety of the northbound carriageway and central reservation whilst slightly overlapping into the southbound carriageway. To avoid the trees, the Proposed Scheme can be moved north or south as well as be split either side of the trees as discussed below.

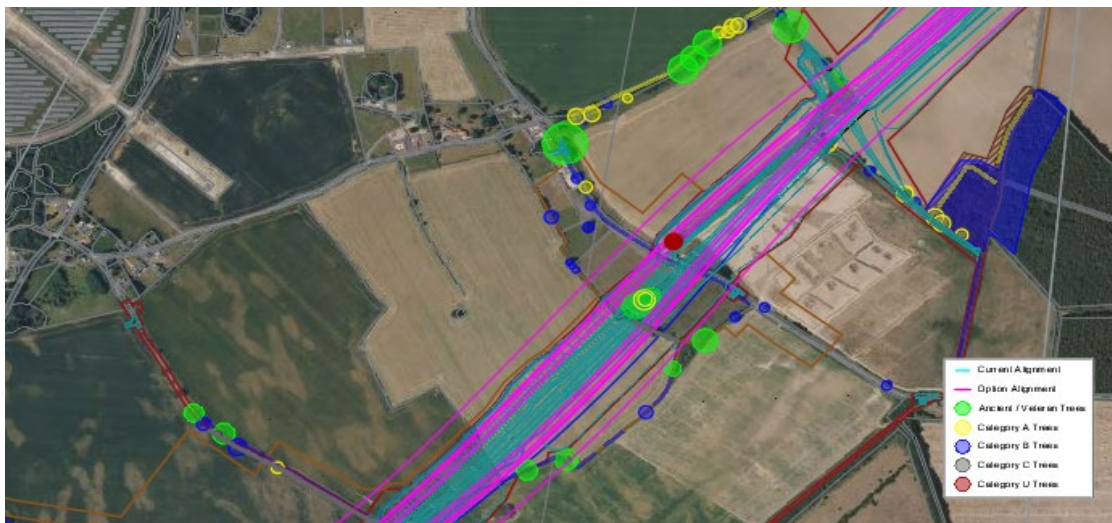
Option 1: Splitting the Northbound and Southbound Carriageways either side of LG138 and LG141



Figure 2.7: Option 1 to retain LG138 and LG141



Figure 2.8: Tree impacts of Option 1 to retain LG138 and LG141



2.2.2 Splitting the Northbound and Southbound Carriageways 25m to the north and south as shown in the figures above has the following impacts:

- Requires the redesign of The Broadway green bridge and Morton green bridge, multiple environmental bunds and maintenance access tracks. T99 and T105 (Veteran Trees), as well as T113, a veteran tree, are required to be felled to accommodate the proposed earthworks. It also requires a similar amount of W69 (Category B) to be cleared to



accommodate the changes (approximately 8,000m²). Veteran Hedgerow H189 will require partial removal due to the associated earthworks. W100 (Category B) situated at the Broadway green bridge is marginally affected by the proposals. Overall, there is further impact of circa 2000m² to W100. To save one Veteran Tree and two Ancient Trees, this option requires the removal of two Veteran Trees, a Veteran Hedge and a Notable tree in addition to 10,000m² of additional woodland. There is also a possibility that Category A trees, T152 and T160 are also affected by the earthwork bunds.

- Splitting the carriageways to avoid the felling of trees impacts the Proposed Scheme from approximately Ch. 2230 to Ch. 4310. It retains the same curve radii of 2880m as the alignments moves north whilst introducing a 4080m radii curve on the south side and a 2880m radii curve on the north, both separated by straight sections, to re-join the proposed alignment.
- Changes to land acquisition requirements.
- Having large retaining walls and significant carriageways either side of the tree provides less than ideal conditions for the tree to grow whilst introducing maintenance issues.

Option 2: Moving the Mainline Corridor to the southside of the trees

Figure 2.9: Option 2 to retain LG138 and LG141

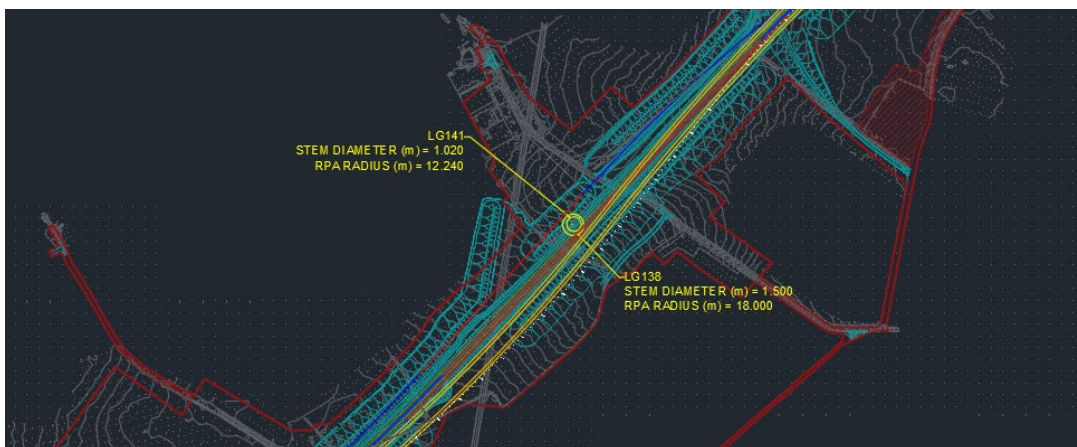
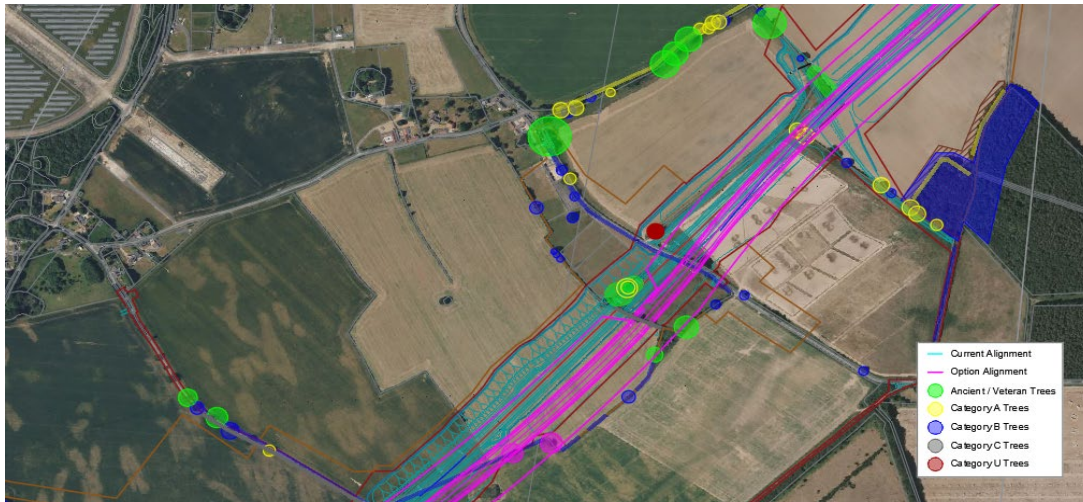




Figure 2.10: Tree impacts of Option 2 to retain LG138 and LG141



2.2.3 Moving the Proposed Scheme approximately 30m south as shown in the figure above has the following impacts:

- Requires redesign of the Broadway green bridge and Morton green bridge, multiple environmental bunds and maintenance access tracks. It also requires the introduction of a retaining structure to protect the RPA of LG138 (Category A) and LG140 (Category C).
- T99, T105, T113, T160 and T152, all Category A Veteran Trees, will need to be removed unless a large retaining wall is added to the south side to protect the RPA. This is in addition to H95 of which an additional 1000m² is required to be removed.
- There may be a significant impact of an additional 1000 to 5000m² of tree removal required within W69 (Category B) due to pass through the woods at a wider section. This depends on the length of bridge deck span as well as the earthworks required. There will also be further impacts upon W100 depending on the design of the bridge deck and earthworks, resulting in a further 1000m² of woodlands being removed.
- Changes to land acquisition requirements.



- Impacts the Proposed Scheme from approximately Ch. 2250 to Ch. 4210. It will retain the same curve radii of 2880m as the alignment moves north whilst introducing a 4080m radii curve, separated by a straight section, to re-join the proposed alignment.
- The 132Kv cables which bisect the alignment between Ch 3000 and 3400 require a diversion to the southern Pylon situated at Ch 3300. This is directly impacted by the earthworks of the alignment.

2.2.4 During this study, shifting both the Northbound and Southbound carriageways to the north has also been considered. This Options would impact on a longer length of the Proposed Scheme in addition to the other impacts discussed above. Back-to-back reverse curves could lead to large vehicles losing balance and overturning, making this option unfeasible. Additionally, significant changes to the green bridges are to be avoided due to them being designed with respect to the local bat colonies flight corridors.

2.2.5 Due to the substantial environmental impacts, Option 1 is immediately ruled out as it is not a viable option due to providing an overall net loss to the local tree/woodland populations. It would not be acceptable to save three trees by removing three other trees of equal quality, a Veteran Hedge and an additional 10,000m² of woodland.

2.2.6 Option 2 is the most viable option to retain the tree groups however, it creates a significantly negative environmental impact on the local area. To save the three trees, five more of a similar quality require to be felled in addition to several thousand metres squared of woodland. The design changes to the green bridges, maintenance accesses, mainline carriageway and their associated drainage and earthwork features will cause a considerable impact. Realigning the Green Bridges would deviate from good practice design principles for this feature and likely reduce the effectiveness of the structure as bat mitigation.



2.3 Veteran Oak Tree T77 and Ancient Hawthorn tree T82

Figure 2.11: Location of T77 and T82 relative to the carriageway



2.3.1 T82 is an Ancient Hawthorn tree which currently stands adjacent to the northbound carriageway and within the Broadway green bridge approach ramp/earthworks at mainline Ch. 3730. With a stem diameter of 0.900m and RPA radius of 13.5m; the RPA covers the full northbound carriageway and part of the southbound carriageway.

2.3.2 The Veteran Oak Tree T77 is situated at approximately Ch. 3800 adjacent to the proposed northbound carriageway within the earthworks bund of the Broadway green bridge and NMU Route 3 junction. With a diameter of 1.300m and an RPA of 19.5m; the RPA covers the junctions bellmouth and carriageways of the NMU route and the Broadway green bridge access.

2.3.3 To avoid the trees, the Proposed Scheme can be moved south with the Broadway green bridge / NMU Route 3 realigned as discussed below.

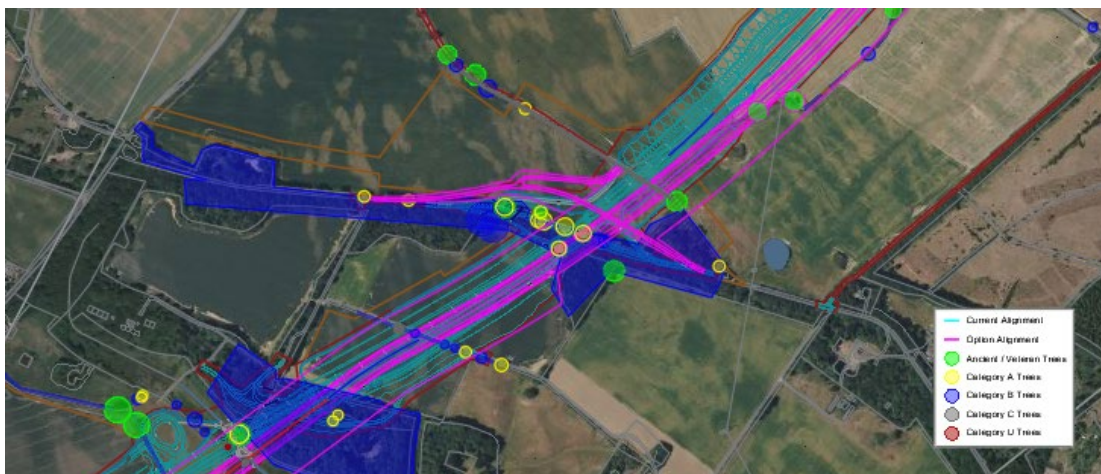
Option 1: Moving the Mainline Corridor south and realigning the Broadway Green bridge northwards



Figure 2.12: Option 1 to retain T77 and T82



Figure 2.13: Tree impacts of Option 1 to retain T77 and T82



2.3.4 Moving the Proposed Scheme south and realigning the Broadway green bridge GB1 northwards has the following impacts:

- Whilst this change accommodates the local trees, it has a potential impact upon the local bat colonies. The justification for the current green bridge location is that it is within a known flightpath of the bats. Realigning the green bridges would deviate from good practice design principles for this feature and likely reduce the effectiveness of the structure as bat mitigation



- Moving the main carriageway to the south has a slight impact upon Moderate Quality Woodlands (Category B) W69 and W100 (circa 1000-2000m²). Whilst this option will save T82, it requires the removal of T99, T105, T113, T152 and T160, all Veteran trees. T49 is also affected by the associated earthworks but is covered in section 2.4.
- To avoid T77, the Green Bridge will need to be pushed 30m to the north outside of the trees RPA. The green bridge will also cross over the carriageway more perpendicularly requiring a compensatory curve on the south side to re-join NMU Route 2, which may impact on the suitability for bat flight paths.
- Overall, the above changes will significantly reduce the impact of the project on W69 and W100 by approximately 10,000m². It also provides an opportunity for Category A tree T81 to remain in situ as well.
- Moving the Proposed Scheme south to avoid the trees will impact the mainline from approximately Ch. 2280 to Ch. 4410. It requires a horizontal reverse curve with a radii of 2800m in both directions.
- Changes to land acquisition requirements.

Option 2: Moving the Mainline Corridor south and realigning the Broadway Green Bridge southwards

Figure 2.14: Option 2 to retain T77 and T82

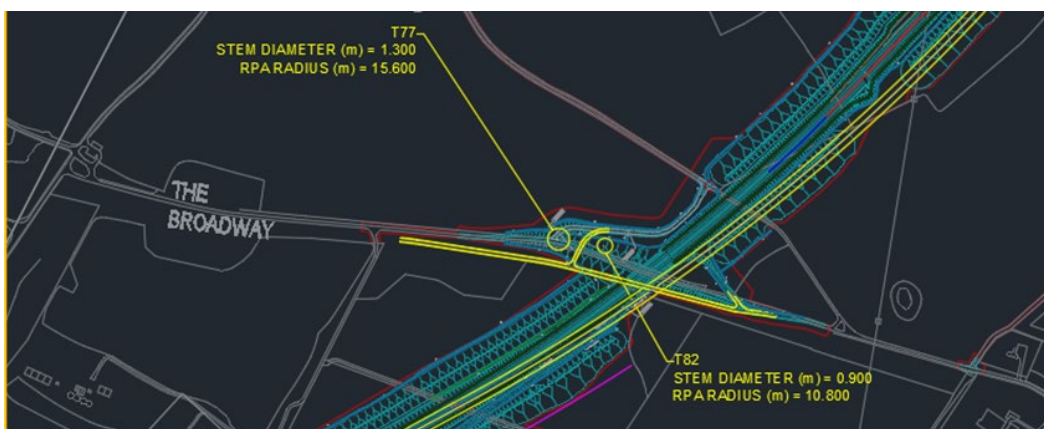
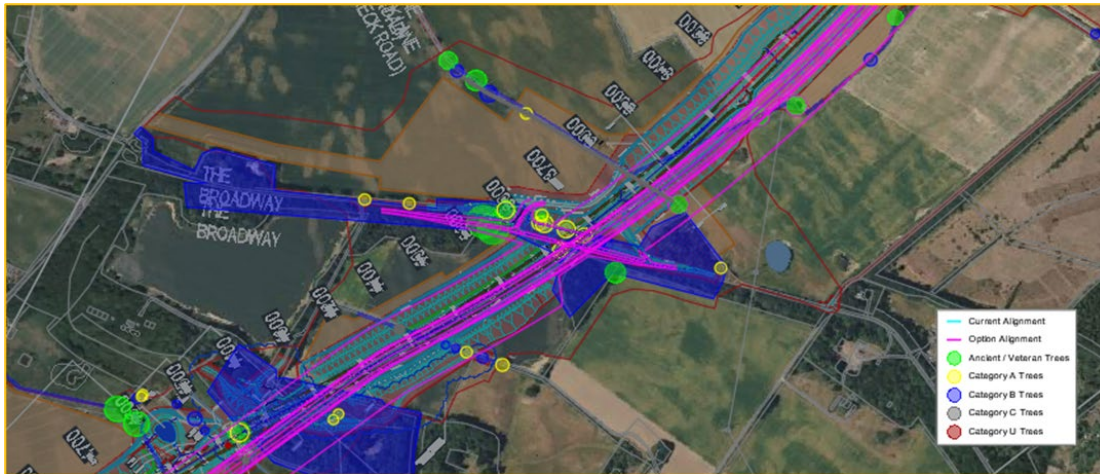




Figure 2.15: Tree impacts of Option 2 to retain T77 and T82



2.3.5 Moving the Proposed Scheme south and realigning the Broadway green bridge southwards has the following impacts:

- As with Option 1, whilst this change accommodates the local trees, it does not align with the known bat flight paths. The justification for the current green bridge location is that it is within a known flightpath of the bats. Although the green bridges can be tweaked slightly, the changes to green bridge design would deviate from good practice design principles for this feature and likely reduce the effectiveness of the structure as bat mitigation.
- Moving the main carriageway to the south impacts upon Moderate Quality Woodlands (Category B) W69 and W100 by a further 7,000m². Whilst this option will save T82, it will require the removal of T99, T105, T113, T152 and T160 all Veteran trees. T49 is also affected by the associated earthworks but it covered in section 2.4.
- To avoid T77, the green bridge is pushed 20m to the south outside of the trees RPA. This will increase the length of NMU Route 3. The green bridge will also cross over the Mainline at a steeper angle requiring a longer bridge deck and a compensatory curve on the south side to re-join NMU Route 2. Overall, this increases the impact of the project on



W69 to the north and south of the Proposed Scheme by approximately 5000m².

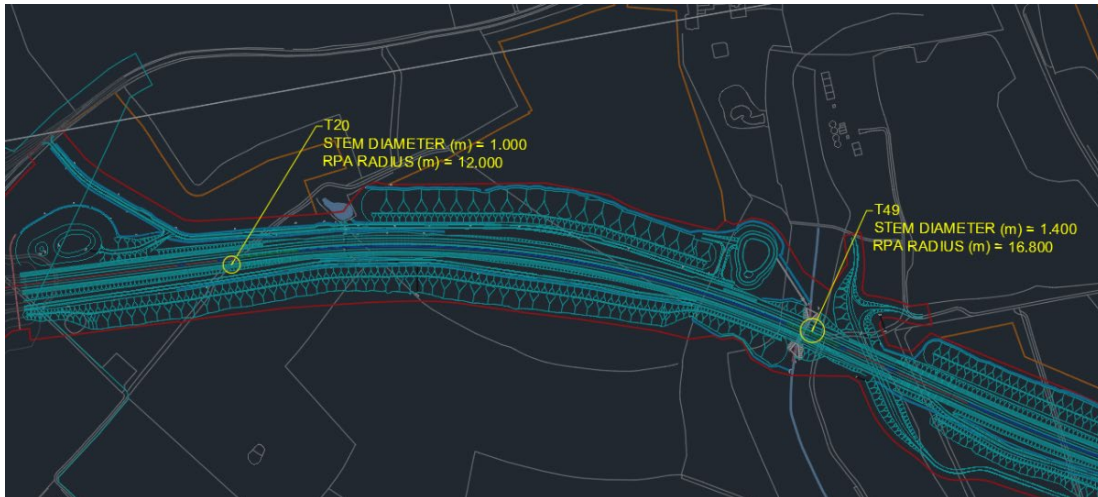
- By realigning the Broadway Green Bridge to avoid T77, it also no longer passes over T82 allowing it to remain in place. However, this option introduces the removal of T72, T74 (both Ancient Oak Trees) as well as still requiring the removal of T81 which option 1 can potentially save.
- Impacts the Proposed Scheme from approximately Ch. 2280 to Ch. 4410. It requires a horizontal reverse curve with a radii of 2800m in both directions.
- Changes to land acquisition requirements.

2.3.6 Both Options 1 and 2 are not deemed viable due to them requiring the removal of more Ancient and Notable Trees than what they would retain in addition to moving the green bridge. The options introduce a significant change in strategy to the design around the Broadway green bridge area. This would lead to substantial changes to the green bridge, accesses, mainline carriageway and their associated drainage and earthwork features. Realigning the green bridges will directly affect the Bat Flight Corridors potentially removing the effective mitigation they provide. In addition to removing at least 5 trees to save two of an equal calibre, the disruption to the bat flight corridors would have a significant ecological impact upon the local area.



2.4 Veteran Oak trees T20 and T49

Figure 2.16: Location of T20 and T49 relative to the carriageway



2.4.1 The Veteran Oak Tree T20 is situated at approximately Ch. 5280 within the proposed southbound carriageway. With a diameter of 1.000m and an RPA of 15.0m; the RPA encompasses all of the southbound lanes and most of the northbound lanes as seen above. To avoid T20, the Proposed Scheme realignment would join the A47 North Tuddenham to Easton DCO scheme roundabout at a different location. This allows the mainline corridor to avoid T20 with the smallest curve possible and also provide a combined option for avoiding T49 as well.

2.4.2 The Veteran Oak Tree T49 is situated at approximately Ch. 4550 within the proposed northbound carriageway. With a diameter of 1.400m and an RPA of 21.0m; the RPA encompasses both northbound and southbound carriageways as seen above. To avoid T49, the Proposed Scheme could be shifted south of the tree in line with proposals to avoid T20. This also requires the realignment of Foxburrow Plantation green bridge.

Option 1: Moving the Mainline Corridor 50m southeast and realigning Green bridges to suit



Figure 2.17: Option 1 to retain T20 and T49

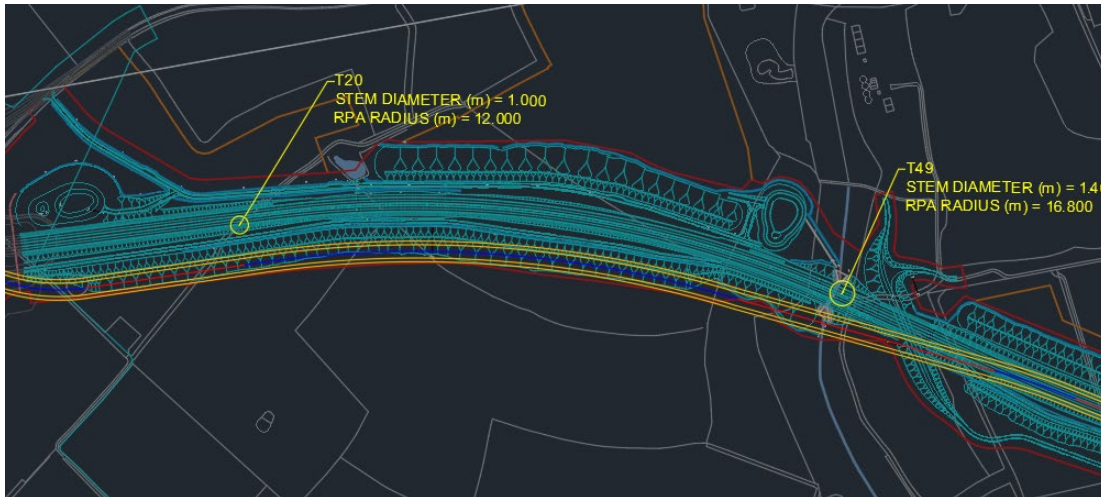
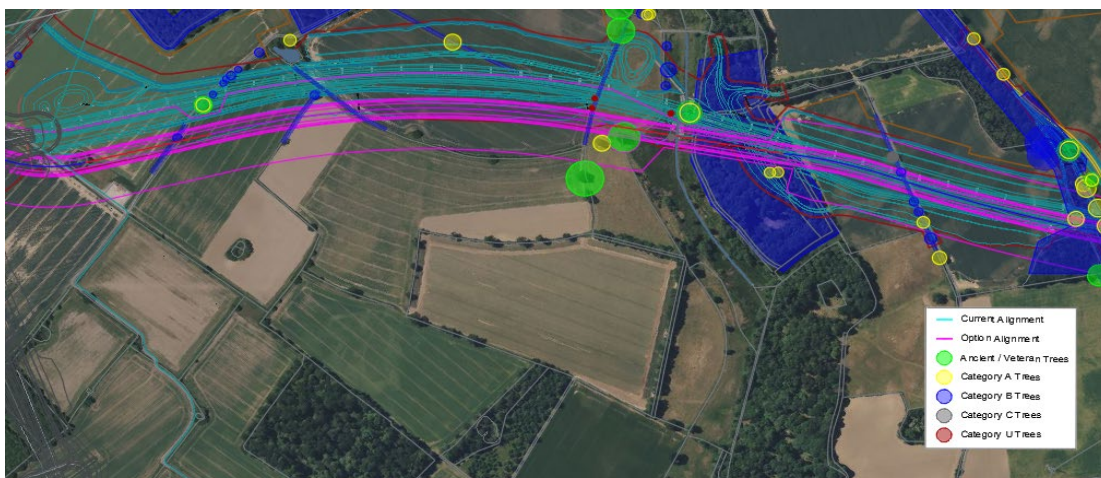


Figure 2.18: Tree impacts of Option 1 to retain T20 and T49



2.4.3 Moving the Proposed Scheme 50m southeast and realigning Foxburrow Plantation Green Bridge GB4 northwards has the following impacts:

- Whilst requiring the removal of similar sized area of W51 as currently proposed (approximately 11,000m³, it also requires the partial removal of a similar sized woods to the southeast which was not covered within the Arboricultural survey. Furthermore, T45 and T47, Veteran and



Ancient Trees respectively, as well as T44, Category A, require removal due to the associated earthworks.

- Whilst this change accommodates the local trees, amendment to the green bridge do not align with the known bat flight paths. The justification for the current green bridge location is that it is within a known flightpath of the bats. Although the green bridges can be tweaked slightly, changes to green bridge design would deviate from good practice design principles for this feature and likely reduce the effectiveness of the structure as bat mitigation.
- The alignment joins the A47 DCO scheme roundabout approximately 45 degrees from its current location as seen below to allow for the required road geometry. This requires a curve radii of 720m (one step below desirable minimum requiring 7% superelevation) coming out of the roundabout to ensure the alignment can remain as close to the original corridor as possible. This is followed by two further 2000m radii curves, separated by straight sections, before re-joining the proposed alignment.
- Impact the Proposed Scheme from approximately Ch. 3900 to Ch. 5635.
- Requires retaining features around T20 and T49 to ensure the associated earthworks remain outside of the RPAs.
- Requires the redesign of Foxburrow Plantation green bridge, the Tud tributary culvert / bat underpass and the Broadway green bridge as well as associated drainage and earthwork features.
- Changes to land acquisition requirements.
- The arboriculture survey did not extend to the full extent of this option and there may be additional veteran or ancient trees affected which are not recorded.



Option 2: Moving the Mainline Corridor 150m southeast and realigning Green bridges to suit

Figure 2.19: Option 2 to retain T20 and T49

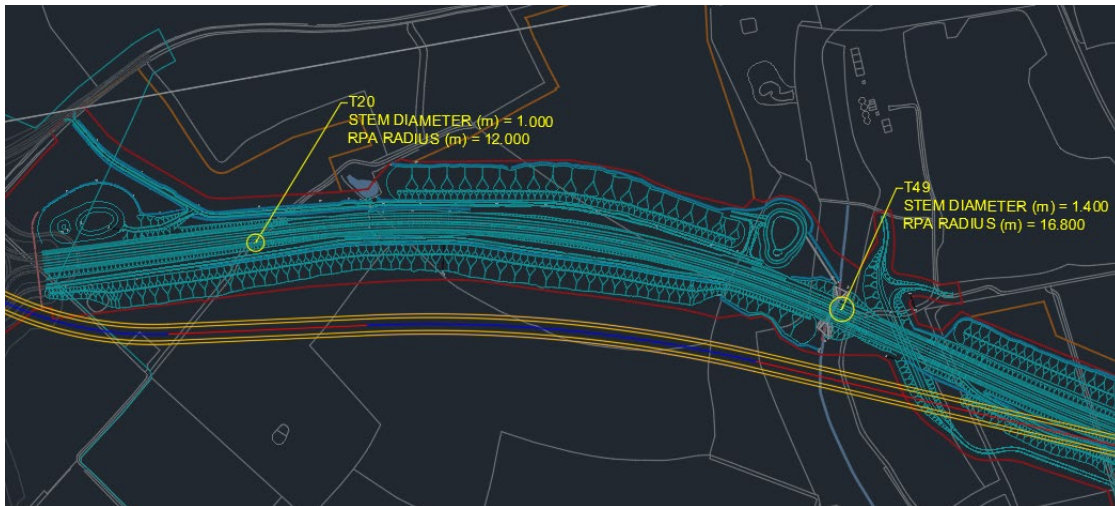
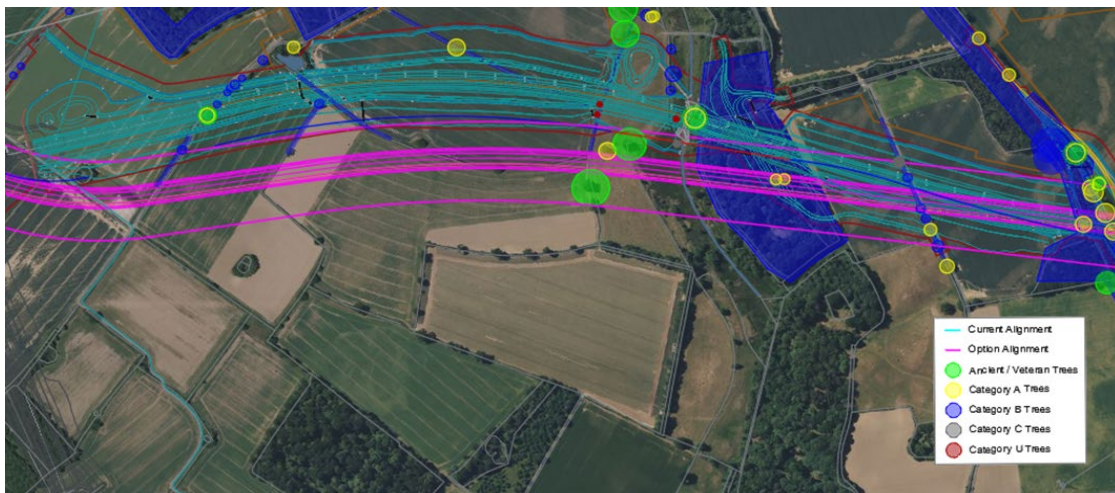


Figure 2.20: Tree impacts of Option 2 to retain T20 and T49



2.4.4 Moving the Proposed Scheme 150m southeast and realigning Foxburrow Green bridge northwards has the following impacts:

- The alignment will join the A47 DCO scheme roundabout approximately 45 degrees from its current location as seen below to allow for the required road geometry. This requires a curve radii of 720m (one step



below desirable minimum requiring 7% superelevation) coming out of the roundabout to ensure the alignment can remain as close to the original corridor as possible whilst avoiding W1 and LG56. This is followed by two further 2000m radii curves, separated by straight sections, before re-joining the proposed alignment.

- Impacts the Proposed Scheme from approximately Ch. 3020 to Ch. 5635.
- Requires the removal of a similar sized area of W51 (Category B) as before of approximately 10,000m².
- Furthermore, T45 and T47, Veteran and Ancient Trees respectively, as well as T44, Category A, need removing due to the associated earthworks.
- Requires the redesign of Foxburrow plantation green bridge, the Tud tributary culvert / bat underpass and the Broadway green bridge as well as associated drainage and earthwork features.
- Changes to land acquisition requirements.
- Changes to land acquisition requirements, whilst making parcels of land currently acquired redundant.
- The gas easement which runs somewhat adjacent to the southern side of the alignment requires moving and redesign to accommodate the shifted earthworks, green bridge and associated access tracks.
- The arboriculture survey did not extend to the full extent of this option and there may be additional veteran or ancient trees affected which are not recorded. The quality and therefore impact on these trees is therefore not measurable at this time.

2.4.5 Neither Options 1 or 2 are viable as both have significant negative impact on the local tree/woodland populations. To retain either tree identified, both require the removal of at least another Veteran or Ancient tree in addition to other Category A trees. Furthermore, lesser quality trees are also heavily impacted by the options which themselves require considerable redesign of core elements and further survey works. Realigning the green bridges would deviate



from good practice design principles for this feature and likely reduce the effectiveness of the structure as bat mitigation. Both Options require significant design change to the green bridges, accesses, mainline carriageway and associated drainage and earthworks, resulting in significant impact to progression of design and delivery programme and likely require planning consideration to review the changes. There could also be significant impacts to A47 DCO scheme due the change in connection point, potentially requiring redesign of elements of the A47 DCO scheme.

3 Conclusion

3.1.1 Overall, there is a little justification for amending the alignment to retain any of the aforementioned Veteran and Ancient trees which are currently proposed to be removed. In all options reviewed, there are significant implications associated with the options which are surmised in the two tables below. The options highlighted in green are the “least impactful” alternative route options to save their respective trees and are shown in Appendix B as an overall combined route.

Table 1: Summary of option assessments

Tree	Option	Comment	Ancient / Veteran Trees Saved	Ancient /Veteran Trees Removed	Overall change in woodland area to be removed
T220	Option 1	Deemed unfeasible due to Ancient, Veteran and Notable Tree impacts	1	6 + 2 notable	+8,000m ²
T220	Option 2	Deemed unfeasible due to Ancient Woodland impact	1	2	+22,000m ² (Including Ancient Woodland)
LG138 and LG 141	Option 1	Deemed unfeasible due to Ancient and Veteran Tree impacts and Woodland Impacts	3	2 + 1 Notable + 1 Veteran Hedgerow + 2 Category A	+10,000m ²



Tree	Option	Comment	Ancient / Veteran Trees Saved	Ancient / Veteran Trees Removed	Overall change in woodland area to be removed
LG138 and LG 141	Option 2	Deemed unfeasible due to Ancient and Veteran Tree impacts	3	5	+2,000 to 6,000m ² + 1,000m ² of H95
T82 and T77	Option 1	Deemed unfeasible due to Ancient and Veteran Tree impacts	2 + 1 Category A	6	-8,000 to 9,000m ²
T82 and T77	Option 2	Deemed unfeasible due to Ancient and Notable Tree impacts and Woodland Impacts	2	9	+12,000m ²
T20 and T49	Option 1	Deemed unfeasible due to Ancient and Veteran Tree impacts and Woodland Impacts	2	2 + 1 Category A	+11,000m ²
T20 and T49	Option 2	Deemed unfeasible due to Ancient and Veteran Tree impacts	2	2 + 1 Category A	Approx' balanced impact*

* The arboricultural survey did not extend to the full extent of this option and there may be additional veteran or ancient trees affected which are not recorded.

3.1.2 The options are summarised within an optioneering matrix (Table 2) to gauge their overall feasibility. This matrix considers the environmental impact, construction impact as well as the design impact. All options have significantly high impacts on the design stage. Where there is a lower impact on the environment or construction stage, the associated impacts on the other two factors are considerable enough to make the options overall feasibility low. Without significant scope change resulting in engineering, environmental, and in some cases safety consequences, the likelihood of retaining any of the seven trees / tree groups is low.

3.1.3 Although it is not captured in Table 1 or 2, it should be noted that all options affect at least one green bridge. The green bridges have been designed with consideration to the local bat flight paths, which is the primary justification for their location and alignment. As mentioned in Section 1.2 the scheme has already undergone redesign to lessen the impact on bats in the local vicinity.



3.1.4 Whilst overall, the options are deemed to be unfeasible due to their ecological impacts, the alternative route option route has been produced and is shown in appendix B as mentioned above. In comparison to the current proposed alignment, the alternative Route presents the following environmental impacts;

- An additional 2,000 to 7,000m² of woodland felling
- A further 11 Ancient or Veteran Trees and 1 Notable Tree to be felled

3.1.5 It should be noted that due to the limitations of the assessment and coverage of the arboricultural survey the impacts could be greater.

3.1.6 It also requires the redesign of all green bridges within the site which, as mentioned above, will have significant impacts upon the local bat colonies, removing or reducing the effectiveness of the flight corridor mitigation.

3.1.7 The tie in point to the A47 DCO scheme also requires amendment to suit the change to the Proposed Scheme at the southern end, which may not be feasible/compatible with A47 DCO scheme designs..

Tree	Option description	Comments	Design Impact	Construction Impact	Environmental Impact	Overall Feasibility
T220	Option 1 - Moving the Proposed Scheme north to avoid T220	Whilst Option 1 is the less impactful option to retain T220, it requires significant redesign of core elements. In comparison to the current design, it requires little additional construction work, but requires further cutting of Ancient/Veteran Trees as well as a large area of medium quality trees. Overall, whilst not impacting upon the construction phase, retaining T220 causes detrimental impacts to the tree biodiversity in the local area and the overall projects programme.	High	Low	High	Low
T220	Option 2 - Moving the Proposed Scheme south to avoid T220	Option 2 is the more impactful option to retain T220. In comparison to the current design, it requires little additional construction work, but requires further felling of a significantly large area of medium quality trees and impact upon Ancient Woodland. Overall, whilst not impacting upon the construction phase, retaining T220 causes detrimental impacts to the tree biodiversity in the local area and the overall projects programme.	High	Low	High	Low
LG138 and LG 141	Option 1 - Splitting the carriageway north and south to avoid LG138 and LG 141	Option 1 presents significant environmental impacts on the local area. There are substantial changes required to the green bridge, accesses, mainline carriageway and drainage and earthwork features. The construction phase is affected by the requirement to produce two separate alignments with associated earthworks, drainage and bridge structures.	High	High	High	Very Low
LG138 and LG 141	Option 2 - Moving the Mainline Proposed Scheme avoid LG138 and LG 141	Option 2 is not as impactful as option 1 however, it still has a significant negative affect on the local area. There would be substantial changes to the green bridge, accesses, mainline carriageway and drainage and earthwork features. The construction phase is minimally affected by the design changes as all elements are similar as currently proposed but relocated / realigned.	High	Low	High	Very Low

Tree	Option description	Comments	Design Impact	Construction Impact	Environmental Impact	Overall Feasibility
T82 and T77	Option 1 - Moving the Proposed Scheme south and realigning the Broadway green bridge north to suit.	Although Option 1 introduces an overall net reduction in woodland removal, it also requires the removal of three Ancient / Veteran trees for each one it saves. There are substantial changes required to the green bridge, accesses, mainline carriageway and drainage and earthwork features. The construction phase is minimally affected by the design changes as all elements are similar as currently proposed but relocated / realigned.	High	Low	Medium	Low
T82 and T77	Option 2 - Moving the Proposed Scheme south and realigning the Broadway green bridge south to suit.	Option 2 presents a significant impact to the local tree biodiversity with the removal of more than four Ancient / Veteran trees for each one it saves, as well as more than another acre of woodland clearance. There are substantial changes required to the green bridge, accesses, Mainline carriageway and drainage and earthwork features. The construction phase is minimally affected by the design changes as all elements are similar as currently proposed but relocated / realigned.	High	Low	High	Low

Tree	Option description	Comments	Design Impact	Construction Impact	Environmental Impact	Overall Feasibility
T20 and T49	Options 1 and 2 - Moving the Proposed Scheme 50m / 150m south and realigning green bridges to suit.	<p>Fundamental design elements of the proposed Mainline Corridor need to be revised to retain T20 and T49 in both options. Furthermore, to save either tree, at least one other Veteran or Ancient tree must be removed in its place alongside a Category A tree, in addition to another 1.1 acres of woodland for option 1. Furthermore, the altered alignment impacts on numerous trees and woods which have not been surveyed. There may be further impacts upon ancient woodlands or trees which are not yet measurable. They introduce a significant change in strategy to the design around The Broadway Green Bridge GB1 area. The substantial change to the green bridge, accesses, Mainline carriageway and their associated drainage and earthwork features results in a considerable impact to the design progression and overall programme. In addition, a change of this size will likely require planning consideration to review the changes. This could also have impacts on the A47 DCO scheme as well as requiring significant quantities of new land acquisition. The construction phase could be significantly affected by the design changes when taking the A47 dualling scheme into consideration.</p>	Medium	High	High	Very Low