

Technical Note

Project:	Melksham Bypass Outline Business Case		
Subject:	Alternative carbon emission assessment		
Author:	CW	Reviewed by:	VS, NW, AR
Approved Date:	19/11/2021	Approved by:	AM
Distribution	Internally, DfT Client	Representing:	<ul style="list-style-type: none"> • Atkins • Department for Transport • Wiltshire Council

1. Alternative carbon emission assessment

1.1. Context

- 1.1.1. The Outline Business Case (OBC) for the Melksham Bypass scheme presents a core assessment of Greenhouse Gas (GHG) impacts based on the Transport User Benefits Appraisal (TUBA) tool. This is consistent with the appraisal of the main travel time benefits and vehicle operating costs and in line with WebTAG Unit A3 Environmental Impact Appraisal (July 2021).
- 1.1.2. WebTAG Unit A3 also refers to other potential methods of assessing GHG impacts. An alternative assessment has been undertaken (for the Core scenario only) based upon:
- Department for Environment, Farming and Rural Affairs (Defra) Emissions Factor Toolkit (EFT v10.1, August 2020) utilising default fleet split assumptions, vehicle size distributions and Euro class compositions. These are based on a set of traffic activity projections from the Department for Transport (DfT) (Road Traffic Forecast (RTF) 2018¹, rebased to 2017 National Atmospheric and Emissions Inventory (NAEI) and DfT car sale projections (April 2019) including the uptake of low carbon passenger cars and Light Goods Vehicles (LGVs) with electric and hybrid electric propulsion systems.
 - WebTAG GHG Workbook (July 2021) – including updated Gross Domestic Product deflator forecasts in line with TAG Data Book v1.15 (May 2021).
- 1.1.3. As the EFT provides emissions factors up to the year 2030 only, the alternative assessment comprises two tests:
- A ‘default’ test, which follows the standard methodology; and
 - A ‘sensitivity’ test, which considers emissions post 2030 through the application of alternative assumptions.
- 1.1.4. The ‘sensitivity’ test is considered to provide a more representative assessment. The ‘default’ test is provided for reference.

¹ [Road Traffic Forecasts 2018 \(publishing.service.gov.uk\)](https://publishing.service.gov.uk)

1.2. 'Default' Test Results

- 1.2.1. The alternative GHG emission assessment 'default' test resulted in a change (between 'with scheme' and 'without scheme' scenarios) in carbon dioxide equivalent (CO₂e) emissions over the 60 year appraisal period (tonnes) of **247,951 tonnes**.
- This resulted in the Net Present Value (NPV) of carbon dioxide equivalent emissions of the scheme of **-£10,644,951**.
 - The upper estimate NPV of the CO₂ emissions of the scheme was **-£16,515,577**.
 - The lower estimate NPV of CO₂ emissions of the scheme was **-£4,776,562**.

1.3. 'Default' Test Assessment Assumptions

- 1.3.1. The following assumptions were made during the assessment:
- The GHG emission assessment was performed using Defra vehicle EFT v10.1 calculation method not TUBA.
 - Only non traded vehicle CO₂ emissions have been determined.
 - The WebTAG was completed in line with the following data source/guidance TAG Unit A3 Environmental Impact Appraisal, May 2019, Section 4 Greenhouse Gases.
 - Traffic Data was provided by Atkins for the scheme opening year 2028 and design year 2043.
 - The assessment included the traffic links within the Traffic Reliability Area (TRA) as confirmed with the transport consultants.
 - CO₂ emissions were calculated for 2028 and 2043, with the emissions for 2043 calculated using the 2030 emission factors
 - CO₂ emissions for 2028 to 2043 were based on linear interpolation between values calculated for 2028 and 2043.
 - Post 2043 the emissions were assumed to stay the same.

1.4. 'Default' Test Assessment Limitations

- 1.4.1. A number of these assumptions limit the accuracy of the GHG emission assessment.
- 1.4.2. The current assessment methodology doesn't take into account the latest government policy^{2,3} including:
- to restrict the sale of new diesel/petrol cars and vans in 2030;
 - for all new cars and vans to be 100% zero emission at the tailpipe by 2035; and
 - for the sale of non-zero emission Heavy Goods Vehicles (HGVs) to be ended in 2040.
- 1.4.3. The current EFT (v10.1) only provides emission factors up until 2030 and the use of these emission factors for the design year (2043) traffic flows may be overly pessimistic given the government's policies for emissions reduction.
- 1.4.4. Beyond 2050, emissions will also be overestimated given government's intentions to reduce emissions and achieve net zero emissions in 2050.

1.5. 'Sensitivity' Test

- 1.5.1. Given that CO₂ emissions are likely to be overestimated, a sensitivity test has been undertaken to provide an indication of CO₂ emissions with and without the Scheme using more realistic assumptions.
- 1.5.2. The EFTv10.1 is based on fleet projections from the DfT RTF 2018. This document includes data from various scenarios, including scenario 7, which assumes all cars and LGVs sold are zero emission by 2040. Analysis of the data behind this scenario shows that between 2015 and 2050, emissions of CO₂ are expected to fall by 80%, representing a year on year decrease of 2.29%, assuming a linear interpolation. Data is provided every 5 years between 2015 and 2050. Between 2030, the closest year to the opening year of

² Department for Transport (2021) Transitioning to zero emission cars and vans: 2035 delivery plan.

³ Department for Transport (2021) Decarbonising Transport: A Better, Greener Britain

2028, and 2045, the closest year to the design year of 2043, emissions of CO₂ from all traffic are expected to fall by 4.47% each year, assuming a linear interpolation. This is expected as the uptake of electric vehicles increases at a faster rate.

1.5.3. Given that this is still more pessimistic than current policy which bans the sale of new petrol and diesel cars and vans by 2030 and hybrid vehicles by 2035, it has been assumed that the year on year reduction in emissions is slightly higher at 5%, and this reduction has been applied to the 2028 emissions and for each subsequent year up to 2050.

1.5.4. Post 2050 emissions have been assumed not to change. This is still a pessimistic assumption, as there will be an ongoing reduction in emissions from HGVs and buses and coaches.

1.5.5. For clarity the assumptions for this sensitivity test are provided below:

1.5.5.1. Retained assumptions:

- The GHG assessment was performed using Defra vehicle EFT v10.1 calculation method not TUBA.
- Only non traded vehicle CO₂ emissions have been determined.
- The WebTAG was completed in line with the following data source/guidance TAG Unit A3 Environmental Impact Appraisal, May 2019, Section 4 Greenhouse Gases.
- Traffic Data was provided by Atkins for the scheme opening year 2028 and design year 2043.
- The assessment included the traffic links within the Traffic Reliability Area (TRA) as confirmed with the transport consultants.
- CO₂ emissions were calculated for 2028.

1.5.5.2. Amended assumptions:

- CO₂ emissions were reduced by 5% year on year from the opening year 2028 up until 2050. Beyond 2050 emissions remained unchanged.
- Changes in traffic flows and vehicle kilometres travelled provided in the design year (2043) traffic data are not considered in this indicative analysis, i.e. any growth in traffic between the opening and design year is not included.

1.6. 'Sensitivity' Test Results

1.6.1. The sensitivity test resulted in a change (between 'with scheme' and 'without scheme' scenarios) in carbon dioxide equivalent emissions over the 60 year appraisal period (tonnes) of **87,562 tonnes**.

- This resulted in the Net Present Value (NPV) of carbon dioxide equivalent emissions of the scheme of **-£3,726,913**.
- The upper estimate NPV of the carbon dioxide emissions of the scheme was **-£5,731,987**.
- The lower estimate NPV of carbon dioxide emissions of the scheme was **-£1,721,472**.

1.6.2. This alternate indicative carbon emissions assessment results in a **65%** reduction in CO_{2e} monetary value and change in CO_{2e} emissions in comparison to the Core GHG assessment.

1.7. Mitigation / Offsetting

1.7.1. CO₂ emissions can be offset by planting trees, which absorb CO₂ at various rates throughout their lifetime. Along the extent of the new bypass, approximately 9 km in length, it is possible that over 15,000 trees could be planted as part of the scheme, with a further 54,000 shrubs (subject to the mitigation planting design and budget availability). The quantity of CO₂ absorbed by this planting is difficult to quantify exactly as it can vary by species and duration of lifetime. However, nonetheless it is reasonable to assume that once the trees mature after 15 years, they could possibly absorb around 20% of the CO₂ emissions generated as a result of the scheme indicated in the sensitivity test over the

remaining 45 year WebTAG appraisal period⁴. The Forestry Commission additionally estimates that planting new woodland absorbs around 300-400 tonnes of CO₂e per hectare by the 50th year after planting⁵.

1.8. Conclusion

- 1.8.1. An alternative carbon emission assessment has been undertaken in relation to the Melksham Bypass Outline Business Case. A 'default' test and a 'sensitivity' test have been completed. The 'sensitivity' test addresses the limitations in the 'default' methodology and is considered to provide a more representative assessment.
- 1.8.2. The 'sensitivity' test resulted in a change (between 'with scheme' and 'without scheme' scenarios) in carbon dioxide equivalent emissions over the 60-year appraisal period (tonnes) of **87,562 tonnes**. With mitigation / offsetting this may be reduced by 14,850 tonnes to **72,712 tonnes**.
- 1.8.3. The 'default' test resulted in a change (between 'with scheme' and 'without scheme' scenarios) in carbon dioxide equivalent (CO₂e) emissions over the 60 year appraisal period (tonnes) of **247,951 tonnes**, with mitigation / offsetting this may be reduced by 14,850 tonnes to **233,101 tonnes**.

⁴ Based on an assumption that a tree can absorb 22kg CO₂ per year, from the tenmilliontrees.org website

⁵ [A5 Leaflet WC Carbon Code V4 Web.pdf \(publishing.service.gov.uk\)](#)