

Technical note

Project:	Newgale WelTAG Stage 1	To:	Neil Carpenter
Subject:	Air Quality	From:	Vicki Sykes
Date:	5 Jan 2017	cc:	

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N.B. The text within this Technical Note will be inputted into a multi-discipline WelTAG assessment prior to issue to the client and will be subject to further change/review.

1.1. Air Quality

Pembrokeshire County Council (PCC) has declared two Air Quality Management Areas (AQMA), which are located in Haverfordwest and Pembroke, approximately 12 and 20 kilometres to the south-east of the study area respectively. These AQMAs are not considered to be of relevance to this study area.

There is one statutory ecological designation within 200 m of the roads included in the study area. This is St. David's Peninsula Coast Site of Special Scientific Interest (SSSI) which is located approximately 40 metres north of the A487 Newgale Hill.

The majority of receptors are residential properties located near to the roads in Roch, Newgale and Penycwm. There are a number of isolated properties in the study area.

1.2. Local Air Quality

1.2.1. Introduction

This section describes the WelTAG stage 1 strategic local air quality assessment.

1.2.2. Method

The assessment followed the WelTAG stage 1 guidance (June 2008)¹. This requires the estimation of exhaust emissions at the source (i.e. not considering the effects of dispersion) to be removed from or added to the network as a result of implementing the proposed options. This approach provides the overall changes in network-wide emissions due to the option compared to the 'Do-Minimum' (DM).

Local air pollution impacts have been assessed in terms of the changes in annual exhaust emissions of oxides of nitrogen (NO_x) and particles (PM₁₀).

Vehicle emissions for the DM and each option have been calculated using a more sophisticated method than that described in the WelTAG stage 1 guidance. As per the DMRB² method for the calculation of road traffic emissions, detailed emission functions for different vehicle types and pollutants dependent on average traffic speed, road type and composition (percentage heavy duty vehicles [HDV]) were utilised. Traffic data were

¹ Welsh Transport Planning and Appraisal Guidance – WelTAG, June 2008, Welsh Assembly Government

² Design Manual for Roads and Bridges, Highways Agency, 2007, Vol11 Sect3 Part 1 – HA 207/07 Air Quality

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provided for the proposed options and surrounding local road network, a list of the roads included in this assessment is presented in Table 8-2. The data included 24 hour annual average daily traffic (AADT) flows, average daily speed, and percentage HDV for four options (Option 3, Option 7, Option 11, Option J) for the opening year (2022).

The Emission Factor Toolkit v7.0³ was used to estimate the total emissions of NO_x and PM₁₀ in the opening year for each scenario based on the measured link length and the traffic data provided. The total emissions for each option were compared with the DM value.

The change in annual vehicle kilometres across the study area is estimated based on link length (in kilometres) multiplied by the daily traffic flow (AADT). The result is then multiplied by 365 to estimate total flow on each link over a period of a year. The total annual vehicle kilometres were summed for each scenario and the estimated change as a result of implementing the proposed options in the opening year analysed.

Table 8-2 details the roads included in the emissions calculations. No change criteria have been applied to determine which roads could be affected by the proposed options. The comparison of change in emissions is indicative and for comparative purposes and the values of the change in emissions may change at later stages of the assessment process.

Table 8-2 Roads included in study area

Link No.	Name
1	A487/ Church Road Crossroads to Option 11
2	Option 11 to Option 7
3	Option 7 to Option J
4	Option J to New Welsh Road Link
5	New Welsh Road Link to Option 3
6	Option 3 to A487/ Welsh Road Junction
7	Southern Cluster Stub
8	Northern Cluster Stub
9	Option 3
10	Option 3 to A487/Newgale Farm Junction
11	A487/Newgale Farm Junction to Option J
12	Option J to Option 11
13	Option 11 to Option 7
14	Solva
15	Penycwm to Trefgarn Junction Option 11
16	Trefgarn Junction to A487/ Roch Hill Junction
17	Option 7
18	Option J
19	Welsh Road
20	New Welsh Road Link

³ Emission Factor Toolkit v 7.0, Defra and the Devolved Administrations, July 2016, available at: <http://laqm.defra.gov.uk/review-and-assessment/tools/emissions-factors-toolkit.html>

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1.2.3. Impact

The total NO_x and PM₁₀ emissions for the various options are presented in Table 8-3 and the change in emissions relative to the DM option are presented in Table 8-4.

The changes in emissions relate to the difference between the option and the DM option for the opening year (2022) with the results in Table 8-4 presented in rank order from most beneficial down to least beneficial. Option 3 results in an overall reduction of NO_x emissions of 1% and no change in PM₁₀ emissions. Conversely Option 7 results in an overall reduction in PM₁₀ emissions of 3% and no change in NO_x emissions. Both Option 11 and Option J result in an overall increase for both pollutants, with the largest increases occurring with Option 11 with a 31% increase in NO_x emissions and 24% in PM₁₀ emissions, in line with the change in vehicle kilometres travelled.

Table 8-3 Total emissions of NO_x and PM₁₀ (kg/yr) 2022

Option	NO _x	PM ₁₀
DM	2,136	249
Option 3	2,114	248
Option 7	2,136	241
Option 11	2,808	307
Option J	2,266	259

Table 8-4 Change in emissions of NO_x and PM₁₀ (kg/yr) in rank order

Option	NO _x	Option	PM ₁₀
Option 3	-22	Option 7	-8
Option 7	0	Option 3	0
Option J	+130	Option J	+11
Option 11	+672	Option 11	+58

1.3. Greenhouse Gas Emissions

1.3.1. Introduction

This section describes the assessment for greenhouse gas emissions. Carbon dioxide (CO₂) is used as the key indicator for the purposes of assessing the impacts of transport options on climate change.

1.3.2. Method

The assessment followed the WeITAG stage 1 guidance (June 2008)¹. Assessment of changes in emissions of CO₂ over a 60 year appraisal period from the opening year (2022 to 2081) and the calculation of a Net Present Value (NPV) for this period are required. Traffic data for four different options (Option 3, Option 7, Option 11, Option J) and a 'Do Minimum', (DM) scenario were provided for 2022 and 2037.

The method as described in section 9.2 above for local air quality was followed to calculate emissions of CO₂ for the opening year and a future year (2025). The traffic data

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were used with the Emission Factor Toolkit v7.0⁴ to estimate the total emissions of CO₂ in 2022 and 2037 for each scenario.

Calculation of emissions for each year in the 60 year appraisal period was undertaken as follows; for the years between 2022 and 2037 linear interpolation between these years was used to calculate an emission for each year in this period; post 2037, emissions were assumed to remain unchanged.

The NPV was calculated in accordance with the methodology and using the worksheets described in WelTAG Unit A3 (December 2015)⁵.

This assessment considers the change in road vehicle exhaust emissions as a result of operating each option, which are considered non traded emissions. The costs per tonne of CO₂ in the non-traded fuel sector are based on the estimated marginal abatement costs per tonne of CO₂ equivalent to achieve the Government's emissions targets provided by DECC. The costs are discounted at standard HM Treasury rates and summated to give a net present value (NPV) of the change in CO₂ emissions over the appraisal period. A positive NPV indicates an overall reduction in carbon and a negative NPV indicates an overall increase in carbon.

1.3.3. Impact

The emissions for the various options are presented in Table 8-5 and the change in emissions relative to DM option are presented in Table 8-6. The change in emissions relates to the difference between the option and the DM option for 2022 and 2037. Option 3 is the only option that leads to a reduction in CO₂ emissions in both modelled years of 1%. All other options are expected to have an increase in CO₂ emissions in both years, with the largest increase in both years with Option 11.

Table 8-5 Emissions of CO₂ (t/yr)

Option	2022	2037
DM	1,435	1,555
Option 3	1,421	1,542
Option 7	1,443	1,788
Option 11	1,886	2,535
Option J	1,530	1,811

Table 8-6 Change in emissions of CO₂ (t/yr) in rank order

Option	2022	Option	2037
Option 3	-14	Option 3	-13
Option 7	+8	Option 7	+233

⁴ Emission Factor Toolkit v 7.0, Defra and the Devolved Administrations, July 2016, available at: <http://laqm.defra.gov.uk/review-and-assessment/tools/emissions-factors-toolkit.html>

⁵ TAG UNIT A3 Environmental Impact Appraisal, DfT, December 2015, available at: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/487684/TAG_unit_a3_envir_imp_app_dec_15.pdf

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Option J	+95	Option J	+256
Option 11	+451	Option 11	+980

The change in CO₂ emissions over the 60 year appraisal period, the change in annual vehicle kilometre and the NPV for each option are provided in Table 8-7. The only positive NPV which represents a benefit is for Option 3 as this option results in a reduction in CO₂ emissions. All other options have a negative NPV as there is an increase in in CO₂ emissions with the options. The ranking order in terms of NPV from most beneficial to least beneficial is Option 3, Option 7, Option J, Option 11, the same as for 2022 and 2037 CO₂ results in Table 8-6 above.

Table 8-7 NPV and Change in carbon emissions and annual vehicle km for entry into the Appraisal Summary Tables

Option	Change in CO ₂ Emissions in Opening Year (t)	Change in CO ₂ Emissions with scheme over 60 year appraisal period (t)	Change in Annual Vehicle km over 60 year appraisal period	NPV (£)
Option 3	-14	-788	+566	+36,048
Option 7	+8	+12,180	+131,354	-568,589
Option 11	+451	+54,568	+848,544	-2,524,657
Option J	+95	+14,072	+205,170	-652,224